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GREEN lights for proceed and red lights for stop make an exceedingly simple and satisfactory signal code for use at night, and nobody has yet devised anything better, except by introducing shape or position signals (colorless) at heavy expense; and every such device thus far introduced has had other faults besides costliness. Unless the engineman is color blind there is practically no fault to be found with this green-and-red code, now so generally favored. But regulations for excluding color-blind and near-sighted persons from the train service are now well-nigh universal on American railways (as well as those of European countries), and we cannot imagine that any railway of any consequence tolerates enginemen with defective vision. With good vision our colors are satisfactory. There was much delay in the accomplishment of this reform, due largely to the tender feelings of the superintendents of 1880-1895 who had not the courage to deprive an old and faithful engineman of his job, even when it was clear that he did not know green from red; but the situation is now so well understood that it would be astonishing to find any considerable neglect of the eye-sight regulations. It is with mild astonishment, therefore, that we see the Traffic Club of St. Louis giving an evening to a lecture by a physician on the dangers of defective vision in the railway service. These are so great, in this physician's opinion, that he would introduce position- or shape-signals at once. He has in mind the injustice imposed on color-blinds by keeping them out of the train service; but as only one man in 25 is color blind this cannot be a great wrong. This lecturer also devotes considerable space in his essay to the need of having signals that can be seen a long way off; but any signal engineer could have told him that, because of the necessity of providing for the running of trains in time of fog, all railway signaling apparatus, fixtures and regulations have to be so arranged and adjusted that the system will be as safe when one can see only 500 ft. from his nose, as at any other time. The argument that an engineman must be able to see a rock on the track a mile away, or an opposing train that is going to collide with him, is also rather academic. Roads that run fast trains have watchmen to look out for landslides; and as for butting collisions, we must have something more than good eyesight, if we are going to prevent them! We mention this St. Louis lecture merely as a notice that if any one knows of a railway which, in spite of the general knowledge on the subject and the simple nature of the vision problem, tolerates enginemen with defective vision, he should report it to the state railway commissioners; or, perhaps, publish its name.

IN discussing last week the country station agent and some of his joys and sorrows we observed that the agent's courage in keeping his building neat was often greatly dampened by unpleasant features which, so far as the agent is concerned, are beyond remedy. The very next day we read in a paper from Ohio the following:

> The X., Y. & Z. Railroad has issued orders that men employed at the station in ——— must appear daily in bright, clean uniforms. The order is regarded as a good deal of a joke, as this station is about the dirtiest building of the kind in the country.

In quoting this item we disguise the name of the road because "all roads have them" and we do not care to give prominence to any one. What makes this particular station dirty we do not know; but everybody is familiar with the station which from lack of paint, or from toleration of English sparrows and other filth producers, as from being surrounded by dusty streets, or simply from old age or bad taste in design, presents a most unpleasant appearance immediately after both the floors and the windows have been faithfully washed. Another incongruity as bad as a neat agent in slovenly surroundings is that of the $100,000 express train manned by a conductor and brakeman whose clothes, by reason of shabbiness, neglect or old age, are fit only for a freight train. We do not advocate the employment of dudes as trainmen; but the strenuous efforts of the passenger department to put everything about a train in condition to be acceptable to the most refined passengers certainly must be regarded as unsuccessful so long as they ignore such a prominent feature as the personal appearance of the men with whom these refined passengers have to deal. It is no answer to this criticism to say that conductors to be competent must be brought up in

the dirty work of running freight trains, for freight train conductors possessing the energy, education and ambition to run a passenger train have enough of those qualities to dress neatly. As a matter of fact, most of these men do groom themselves properly some of the time. It is the duty of the trainmaster to see that they do so all of the time. In the note of last week we referred to the unpleasant numerousness of station buildings to-day which are no cleaner or more attractive than the buildings of 1884, but the proof reader, by changing the word "no," converted that sentence into nonsense. This error is particularly annoying, because when we set out to commend the work of Charles Paine we desire to make no mistake, for he was a prince among writers as well as among railway managers.

THE chief engineer of a large railway system, commenting on a recent article in this paper on "Time Tonnage Rating of Fast Freight Trains" (*Railway Age Gazette*, June 17 and 24, 1910) remarked that in railway operation ideals always have to give way to compromises by which may be secured the most that is practical. As he pointed out, it may seem foolish to run an overloaded engine at slow speed when there is always a "right load" which, considering motive power only, can be hauled more economically at a faster rate, assuming that ample tracks were available. But traffic has an awkward tendency to move in two directions, and until tracks are provided for an uninterrupted movement both ways the overloaded engine and the slow movement of freight will continue as an annoying factor in railway operation. On a double track line properly equipped with signals both tracks are available for movement in both direction, the effect being that of continuous passing tracks, but on a single track line the proper disposition of passing tracks is a serious problem. Numerous trains carrying loads so proportioned to the engines that the maximum economical speed may be attained call for a clock work nicety in operation that cannot be attained after the volume of business increases to the point that calls for double tracking. The loading of freight trains so that the freight may be carried in the shortest time with the least expense for fuel and attendance must stop when the freight business is developed to the point where it interferes with passenger train operation. The passenger train, traveling on an average at double the speed of the freight, must perforce take to a passing track occasionally, and the first time this happens conflict begins. From that day the problem becomes one of adjusting the freight and passenger train schedules so that the former cannot interfere with the latter. A few long comparatively slow moving trains on a system cause less trouble in case of accident than a large number moving according to a fixed schedule. This subject is timely because many systems now have single track lines which are being worked to the practical limit.

BALLAST IN TRACK DESIGN.

ONE of the questions before the committee on ballasting of the American Railway Engineering and Maintenance of Way Association is that of the proper thickness of ballast to insure uniform distribution of loads on the roadbed. At present some assume the load to be distributed in a pyramidal form, the sides of the pyramid being inclined at an angle of 60 degs., so that the base widens with the depth. Others hold, and their opinions can be backed up mathematically, that the distribution of the load in loose material does not follow a straight line but is along a curve which approaches the vertical.

If this be true the distribution of load over a larger area as greater depth is reached ceases at a comparatively shallow depth and added ballast is useless. The distribution of load, then, in loose material is an important matter to investigate. If the straight line distribution of load is correct the unit load on the roadbed can be reduced to any amount desired by increasing the thickness of ballast under the ties and varying the spacing of the ties so that the toes of the pyramids of which the rails form the apexes will not overlap. Should the curved line theory of load distribution through loose materials be found to be correct the present American practice of close tie spacing will be justified; the theory of track construction being to consider the rail as a girder supported on cross ties which form non-rigid supports. The minimum practicable tie spacing is that which will permit proper tamping between ties. With the adoption of heavy rails the tendency has been to widen the space between ties, the heavy rail forming a stiff girder calling for fewer supports. With the ballast carrying the load through a pyramid it may be proper to lessen the number of supports with an increase in rail depth, but if the ballast carrying the load is in the form of a solid ellipse then the use of heavy rails will insure a more rigid track provided the number of ties per rail is not reduced, and such a reduction is not warranted on this hypothesis.

For years the question of the proper thickness of ballast has been settled by considerations of first cost and the theoretically proper design of track has not been attempted. If the investigation as to load distribution through loose materials is carried out by means of experiments thorough enough to determine the truth a great development in track construction along economical lines may result. It was first pointed out by Wellington that the per track-mile for maintenance varies with the character of the roadbed and is less with a good roadbed, but the cost per train-mile is practically independent of the track-mile cost. This is not due to the operation of any unvarying natural or economic law, but to the simple fact that improvements in standards of construction and maintenance can be made only when the increase of traffic yields larger earnings which can be applied to the improvement of these standards; and on the other hand, it is this increase in traffic which makes the improvements in standards necessary. The most durable part of the track, the rail, comes the nearest to involving a constant cost per mile of road. The rail makers having declared that little more improvement can be expected in rails and that increased depth of rail means added difficulties in fabrication, further improvement in track probably must be secured by obtaining more durable ties and a better knowledge of the true action of the ballast in distributing loads to the roadbed. It surely is possible by improved methods substantially to reduce the cost of track maintenance per train mile below what it was fifty years ago, even though not much reduction in it has been accomplished heretofore.

THE NEW THEORY OF REASONABLE RATES.

IT looks as if the shippers are going to rely for success in their fight against advances in freight rates mainly, if not almost wholly, on figures and arguments tending to show that the railways as a whole are earning a "fair return," and, therefore, are not entitled to higher rates; their notion of a "fair return" being the current rate of interest. In other words, they are going to take the position that the true criterion of the reasonableness of rates is the amount of the aggregate earnings of the railways. This shows how far from the old idea of what constitutes a reasonable rate our efforts at regulation of railways have led us. The old idea of a reasonable rate was one which did not unfairly discriminate and was not extortionate. If none of the rates in an entire schedule was excessive per se, it was considered that the entire schedule was reasonable, regardless of what profit the carrier earned. The new idea is that each of the individual rates in a schedule may be reasonable and yet that, taken as a whole, they may be unreasonable if by charging them the carrier makes over 6 per cent. Just how each of the rates in a schedule may be reasonable and all of them may be unreasonable, we leave to be settled by those who know more about the subject than we do. We cannot refrain, however, from calling attention to some of the interesting conclusions to which this sort of reasoning about railway rates leads.

It starts with the premise that if a road's earnings are large

its rates must be excessive. On the same theory it must be that if a road's earnings are small its rates are too low. So the right way to get the rates of the former road on a reasonable basis is to reduce them. But suppose, as frequently happens, that a reduction of rates leads to an increase in profits. In that case the *reduction* of the rates makes them still more *unreasonably high.* On the same theory the right way for the road whose earnings are too small to make its rates reasonable is to increase them. But an increase in its rates may destroy traffic and reduce its earnings. In that event, the *raise* in its rates makes them more *unreasonably low* than they were before. With every further increase of its rates, its earnings will be further reduced, which, on the theory in question, will make its rates more reasonable; and if it would but so advance its rates as entirely to destroy its earnings it would make its rates reasonable indeed!

Let us apply this new theory in another way. Here are two competing roads which cost the same amount to build, have the same capitalization per mile, and charge the same rates, but one of which is earning 8 per cent. and the other only 4 per cent. Now, are their rates reasonable or unreasonable? It is evident, on this theory, that the road which is earning only 4 per cent. ought to be allowed to raise its rates, and that the road which is earning 8 per cent. ought to be compelled to reduce its rates. It must be, therefore, that the *same* rates applied to the same traffic in the same territory can be both reasonable and unreasonable at the same time.

A visitor from Mars might suggest that the difference between the profits of the two roads does not indicate that the rates are either reasonable or unreasonable, but merely that the more prosperous road is better managed than its competitor; and he might contend that it is entitled to receive a larger profit as the wages of good management. But the spokesmen for the shippers would repudiate this suggestion, and tell him that the railway is entitled only to a "fair return" and that the shipper is entitled to receive, in the form of reductions in his rates, all the benefit of any good management which, except for reductions in rates, would enable the road to earn more.

This doctrine is so confidently enunciated and widely accepted that to reject it seems like heresy. And yet it does not appear to be very well founded. The law requires the carrier to haul the shipper's goods for reasonable rates. This is because the railway is a *public* service corporation. The shipper not being the entire public, his cheerful assumption that the railway owes no duty except to him can hardly be correct. Travelers are part of the public, and the carrier owes to them also the duty of giving good service at reasonable rates. It owes to the entire public the duty of making transportation safe, whether for those who ship in its freight cars, who are in its employ, who ride in its passenger cars, or who cross its tracks on the public highways. The shippers lay great stress on the value of low freight rates. But there is something else that is even more important to the public, and that is good and safe transportation service. And the more of the railway's earnings that are appropriated for the benefit of the shipper by reductions in freight rates, the less able will the railway be to give good service. Then, there is still another part of the public to which the railway management owes a duty: Its stockholders. Unlike its bondholders, they did not loan the railway corporation money. They invested their capital in its securities, taking the risk of getting a return much less than the current rate of interest, in the hope and expectation of getting much more.

We have touched on these points to call attention to the fallacy of the argument that the reasonableness of a railway's rates is to be measured by the amount of its net earnings. Whether rates which yield a given amount of net earnings are reasonable or unreasonable depends not only on the amount of those earnings but on the value and amount of the services which are rendered in return for the rates charged, and also to some extent on what use is made of the earnings derived from them. If the railway devotes part of its earnings to improving its property, so that it can render safer and better service, it thereby confers a benefit on the entire public. When it reduces its rates and thereby reduces its earnings, it confers a benefit on only part of the public. We shall never deal consistently or beneficially with the question of railway rates until we look beyond those immediately affected by the rates charged—the traveler, the shipper and the railway—and consider what are or will be the effects, in the long run, of a particular policy which is being followed or which is proposed on the entire public, of which travelers, shippers and railways are merely parts.

STRENGTH AND WEAKNESS OF RAILWAY ARBITRATIONS.

TWO somewhat inportant street railway arbitrations have just ended in Massachusetts involving the wage of trolleymen in Worcester and Springfield. They concede slight "compromise" advances to the men. There have followed larger arbitrations, some of them on big railways, and other arbitrations are pending. The general situation indicates a distinct tendency toward arbitration as an agency of settling railway disputes with labor, taking generally the form of a board of three formed by two appointive representatives of the disputing interests and a third chosen by the first two. The situation may be temporary and the result of the frequency of the dispute with labor; or it may prove temporary from the development of weaknesses and disputing factions, particularly as labor, generally speaking, seems to get the larger profits. On the other hand, arbitration may gain permanence as a sequel of organized labor's more general acceptance of it and both the corporate and public dread of strikes, a dread which seems to be increasing. We may even be entering on the initial stage of a period when the ultimate is to be official arbitration, advisory at first, and at last, perhaps, compulsory.

The present condition of voluntary arbitration by a board of three, organized in the manner stated, has its strength and its weakness. On the positive side its values in avoidance of a strike are in the foreground and obvious. There are few worse evils in the contacts and collisions of labor and capital than the strike, extensive, protracted and violent, of the employees of a public service corporation. The innocent public, the corporation and the men suffer, and in somewhere nearly equal ratios; and the injury of the men must be reckoned not merely in the loss of wages, but in morale, discipline and character. If the strike is successful this last evil often stands first; and if the strike, as it often does, ends in an arbitration or other form of compromise, its ills become the more lamentable because so gratuitous and originally avoidable. But there are, after all, worse things than a strike immediate. One of them is the weak yielding of a principle that sooner or later, as new demands increase and culminate, spell the worse strike ultimate. Still, with that reservation, the potency of arbitration as a preventive of labor disorder is readily conceded. If not carried too far there must also be granted its good moral and mental effects on labor as familiarizing it with peaceful methods in contrast to the opposite mental influence of the strike.

A second beneficent result of arbitration in its up-to-date form is its finality for the stated period of the finding—and there usually is a stated period. In the courts, the labor dispute—or other dispute—must run its mazy, long and indefinite path. There are delays, appeals, counter appeals, overrulings and rehearings. The "boycott" case in the United States tribunals, still pending, is a familiar one to the point. But the arbitration ends quickly and ends with itself. It has no court of appeal; and its good and growing tendency now is not only toward fixing definite periods for the agreement, but toward prolonging those periods. A better tendency still is that toward complete acceptance. Labor unions, particularly on the railways, are often and justly accused of violation of minor compacts. Not so in these days, with the clear-cut finding of arbitrators which command more and more finality and respect and which, as agreements, even the labor agitator does not often dare attack. Indeed, there seems to be developing slowly but steadily on the railways a body of

erstwhile agitators turned to arbitration attorneys without their law degree—men who as "national officers" find surer and more legitimate profit in arguing or managing labor cases in arbitrations than they received as walking delegates. Perhaps in this new body the old pernicious walking delegate will at last find his antidote.

The weakness and, it may be, the future peril of arbitration rests in the conditions of the choice of the "king pin," the third arbitrator. Theoretically he should be the strongest man in the board—strong not merely in his sense of justice and power of descrying the equities, but an arbitrator with force of character and with individuality. In him ideally should blend the traits of the trial justice and the lucid, moral vision of the common sense layman. Such is the theory. In practice too commonly the product of the double selection is the reverse. The third arbitrator is apt to fall into the category of the "available" man who wins the party nomination in a closely contested district. Individuality, positiveness, decision of character go by the board. A "compromise" of outward respectability is chosen often even by the two primary arbitrators who may be men of determination themselves. And the finding is like unto him—a balancing of this and that, a set-off of one paltry consideration against another. Very rarely, indeed, is there an absolute finding for the railway—or the other side—where one only may be right. Even less often is there a recognition of moral, as distinguished from material forces in the verdict, though that verdict must be expressed in terms of dollars and cents. That the three arbitrators sometimes agree in the compromise verdict does not strengthen it intrinsically.

In seeking the betterment of these boards that are the product of voluntary arbitration of the railway's disagreement with labor there are difficulties in the way. If a single arbitrator is to be chosen by the conflicting parties in place of three the same obstacle is encountered in finding the arbitrator who is both just and able, while the man of special training is apt to be ruled out by his affiliations. The other extreme of adding to the size of these arbitration boards has the merit of increasing the chance of securing at least one arbitrator of dominating personality. But it also means increased delay in the constitution of the board, its greater cumbrousness and its longer sessions. The courts have been suggested as appointing power for arbitrators, whether single or multiple. They would probably give us stronger arbitrators than are secured now, but they are not acceptable to labor and the outcome would probably be no voluntary arbitrations at all. On the whole, finding these seemingly inherent obstructions to the selection of positive arbitration boards, we must be content with them as they are. We may regret that the great interests of the railways, represented by wages as an element of operating expense, are so often the victims of weak compromise. But far better that, usually, than prolonged dissension, rupture and the strike. Arbitration is not the only railway problem in which conditions fall short of the ideal.

Letters to the Editor.

RAILWAY OFFICERS' TITLES.

August 26, 1910.

To the Editor of the Railway Age Gazette:

Will some aspiring genius please step up and suggest a decently simple and intelligible set of titles for railway officers? Have we not on this continent carried the title business in railway work to the limit of absurdity? We boast that in America is found the only simon-pure brand of democracy, clear and undefiled, but on our railways we lavish high-sounding titles on the functionary who mails the stationery and the lead pencils; and on the obliging young man who keeps the wires warm until he finds out for you why one brown leather suit case, covered by baggage check 4-11-44 did not arrive from Ogdensburg on the "Coronado" local. And we have our tables of precedence. To the uninitiated it may look laughable, but to us it seems quite the thing that the head lost baggage finder, pardon me, the General Baggage Agent, should be entitled to much more respect than the quiet, brainy young man who is the General Manager's Prime Minister and Father Confessor. But then you see the latter has no title—he is only a clerk, and the Great Baggage Agent addresses him as "Son," lounges over the corner of his desk, asks him how the "Old Man's" liver is this morning and patronizingly hands him out a cheap cigar. A well-groomed, pleasant young man talks to the dining car conductor and quietly suggests a change of water for the carnations on the next table; he looks to be merely a capable young American business man. Hush, he is more; you are in the presence of the General Superintendent of Dining and Parlor Cars, Restaurant and News Service of the great P. D. I. Railway. The shrewd, middle-aged man with the air and attire of a prosperous farmer, who gets off the train at Brown's Corners, inquires for Farmer Brown's farm, and drops down there to negotiate for two acres of right-of-way for the Hazleton Branch; Who is he? Right-of-way buyer, you say. Nothing of the sort. That's the Right-of-way, Lease and Industrial Commissioner of the Yukon division of the Transcontinental Road.

And so it goes. The plain business man comes in from a nearby town to the city where the headquarters of the great railway company are located. He wants to know if he can get a spur track to his new brick plant; he asked the division superintendent for it six months ago and the latter officer endorsed the application and started it on its rounds, but it is now stalled somewhere—nobody knows where. Mr. Business Man decides he'll find out. He enters the general office building with a bold and firm step, takes a look at the directory in the lobby, gasps, and then gasps some more. Where is he to find his man among that medley of chiefs of this and chiefs of that, and superintendents of this and superintendents of that, managers of this and managers of that? Where is he to look for the authority for his spur track? He gives up. He goes home, and some time, perhaps five years hence, the application will finally receive the last august signature and the division superintendent be told that if Mr. Brown is still alive and will deposit the cost of the track and sign a fifteen-page copper riveted agreement he may have his 200 ft. of track. Oh, for a Dickens to describe the Circumlocution Department of some of our great railways.

But we stray from the point. The readers of your journal probably have an illustration of what I mean in the next office, or in their own. We have First, Second and Third Vice-Presidents who could never "preside" because they have no seat on the board. We have Freight Traffic Managers and Passenger Traffic Managers who do not manage anything but the rate schedules. We have Superintendents of Motive Power who are not superintendents, but expert advisers. We have Superintendents of Transportation who are merely car accountants with enlarged territory.

What is the object of giving a railway officer a title—to gratify his self esteem? No. To give his wife prestige? No. Then what? To convey to the public, to the officers and employees of his own railway and the officers of every other railway a clear idea of just what duties he is supposed to perform.

What is the first requisite? Simplicity. What is the second requisite? Simplicity. And the third? Again I say simplicity.

Then why not copy the worthy example of poor old title-ridden England and keep the name "Superintendent" for the man who superintends and operates the railway. There the Division Superintendent of a leading railway, in spite of the civil service system of advancement, is almost a national figure. The sovereign who passes in safety and luxury over his division once or twice a year honors and possibly decorates him. If a sovereign started passing decorations around on an American railway he would be so dazed by the number and variety of the officers that he would be decorating the negro porters, along with Assistant

Vice-Presidents (as an Oriental prince did a few years ago on a certain road.) The General Manager in England is the man who really "manages" and is not the overworked piece of machinery who carries out the behests of an army of Vice-Presidents and dodges the brickbats hurled at him by several energetic Traffic Managers.

Probably we could never have the same simplicity which obtains on English and some European railways, but surely with all our originality and inventive genius we can devise a railway organization which would work smoothly. The first step would be to have a set of titles which meant what they meant.

GENERAL MANAGER.

THE LAW OF COAL CAR DISTRIBUTION.

New York, August 26, 1910.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In a letter of mine which you printed on January 28, 1910, I attempted to outline the effect of the recent decisions of the Supreme Court in the coal car distribution cases, but called attention to the fact that while most questions in regard to coal car distribution were settled there were still open questions in regard to the mine rating upon which the car distribution must depend. I attempted to state the question as follows:

> "Shall a mine be rated on the amount of coal which can be physically taken out of it in a day, or shall it be rated on its past shipments?"

and ended my article by stating that the decision that past shipments were a proper element in rating coal mines would help considerably the settlement of the coal car question.

That decision has now come in the Interstate Commission's opinion No. 1383 in the case of the Hillsdale Coal & Coke Company vs. Pennsylvania Railroad, a digest of which was given in your issue of August 26. In this decision the Commission speaks of the past shipments as being a proper indication of the mine's "commercial capacity" and it confirms the legality of the Pennsylvania Railroad's arrangement under which the rating of a mine is based on an average between its physical and commercial capacities, the commercial capacity being determined by the total commercial shipments of the preceding year.

It is to be noted that the Commission in approving of this arrangement is careful not to give an exclusive approval. In a previous case, that of the Rail and River Coal Co. vs. the Baltimore & Ohio, the Commission has given a qualified approval of the B. & O. Co.'s method, which, while it combines physical and commercial capacities, does it in a somewhat different way from that adopted by the Pennsylvania.

The Commission is to be congratulated on its breadth of view in recognizing that there may be more than one legal way in which to rate a mine. I have already called your attention to the fact that there is plenty of room for improvement and development of mine rating. The subject of mine rating and coal car distribution was a matter of careful study and experiment by many railway officers up to the year 1906, when the coal and oil investigations were begun. One of the unfortunate results of that investigation was that many of the roads felt obliged to defend and to adhere to the systems of car distribution which they then had in effect; and it became almost impossible for the railway men to aid in the developments in car distribution which have been made since that date. Now that a certain leeway is allowed by the Commission, it is to be hoped that the roads will take advantage of it and improve their car distribution system wherever this is possible.

The ruling of the Commission in this matter should tend to stop the over-development of mines which has been so prevalent in the many cases where mine owners have thought and hoped that their rating would be based entirely on physical capacity. This tendency toward extravagant and premature development of mines has been a source of many troubles, and, possibly, of many accidents.

Although the Commission upheld the railways in this matter, it has pronounced illegal that part of its distribution system under which the Pennsylvania Railroad gave a certain advantage to the owners of private cars and the shippers of fuel coal. The Pennsylvania held that any arbitrary allotment of cars to a mine reduced the capacity of the mine on that day by so much, and allotted its own cars on the basis of this allotment. The Interstate Commerce Commission finds this to be an "undue and unlawful discrimination" and it makes the same order in the case of the Pennsylvania Railroad that it has in the case of other carriers, to the effect that all cars must be distributed on an absolutely equal basis, the only exception being that a mine may receive more assigned cars on a particular day than its quota entitles it to, provided that it receive none of the railway company's cars.

I hope I am not hypercritical in calling attention to what appears to be an oversight on the part of the Commission in this matter. When the Commission states that this system of the Pennsylvania Railroad in reckoning mine capacity "results in an undue and unlawful discrimination," it does not quote from Section 3 of the law, which, it seems to me, covers the case in point. It is true the word "discrimination" is used in Section 2, but Section 2 applies only to rates and manipulations of rates. Under Section 2, if a carrier by any device gives one rate to one person and another rate to another, it is guilty of "unjust discrimination."

The law on car distribution is expressed in Section 3, which makes it unlawful for any carrier to make or give any "undue or unreasonable preference or advantage." Is it not possible that the Commission upon further consideration of the subject may concede that under Section 3 certain preferences or advantages may be due and reasonable, and that it may be lawful for the railways to exercise a little more discretion in rating of mines and possibly in car distribution? The opinion in this case especially states that the Commission does not feel that its decision is absolutely final, and, as noted above, one exception to its rule is allowed already.

There seems to be no doubt that the decision as it stands will be accepted by the railways, the right of the Commission to regulate such matters having been so expressly confirmed by the Supreme Court in the Illinois Central case.

There are other parts of the decision that are comforting to the railway men who have struggled with this question of car distribution, and especially the statement of the Commission as to the obligation of the carriers in this matter, as follows:

> "The utmost obligation that the law lays upon the carrier is to equip itself with sufficient cars, not to meet the hopes and expectations of the owners of a mine as expressed in its physical development, but to meet his actual shipments. A mine rating that is adjusted to the expectations of the operator and altogether ignores his actual requirements might easily result, in a period of car shortage, in giving him cars for every ton of coal that he can actually dispose of, while an adjoining mine, with a small development but a larger demand for its output, would get but a fraction of the equipment that it needs to meet its actual contracts."

Mr. Prouty, in a dissenting opinion, which is as interesting as his opinions always are, emphasizes the conservative tone of this decision by giving his own somewhat more radical views, as follows:

> "* * * At times the number of private cars delivered to certain mines has exceeded the quota of those mines * * * In such case it seems to me that the railway is guilty of discrimination. * * * A railroad * * * might and should decline to put private cars into service except upon condition that there shall be no discrimination of this kind."

Mr. Prouty, however, apparently feels that the private car is doomed, as he explains that this may not be a matter of much importance in the present case.

ARTHUR HALE.

WORKMEN'S COMPENSATION FOR INJURIES.*

BY JOSEPH N. REDFERN,
Superintendent Relief and Employment Departments, C., B. & Q.

The Employers' Liability Commission of Illinois, consisting of six representatives of labor and six representatives of employers, appointed by the governor under authority of the legislature, has announced a tentative plan of a workman's compensation bill.

The plan proposes payment of three years' wages in cases of death where there are dependents, but in any event an amount not less than $1,500 nor more than $3,000—if no dependents, a sum not to exceed $200. In cases of temporary disability lasting two weeks or more, payment of half wage from first day of disability; in cases of permanent disability, payment of half wage not to exceed eight years, commencing after second week of disability. Where disability is permanent but only partial, percentage of compensation to be reduced proportionately to reduction in earning capacity.

The compensation to be paid for death or disability due to injuries received while at work regardless of any question of negligence, except in cases of serious or wilful misconduct of the employee. The law to apply only to employers of labor who have more than five persons employed at one time. All amounts to be paid in instalments, unless, if proper showing is made, the county court may order amount of compensation due paid in lump sum.

It is not proposed that the employer shall be compelled to make these payments or the employee or his legal representative to accept them. Common law remedies, including trial by jury, are to be reserved to both parties, but if the employer declines to pay the stipulated sums and suit is brought, the employer is not to escape liability by reason of the fellow-servant rule, the assumption of risk, or the contributory negligence of the employee, unless the negligence of the employee be greater than that of the employer, in which event the damages shall be apportioned according to the relative degree of negligence and the burden of proof is placed upon the employer. Acceptance by employee of compensation to bar his right of action, and beginning of suit for damages to bar his right to compensation, except in the case of wilful negligence of the employer or his failure to comply with statutory or municipal safety regulations.

It will be observed from the above that the proposed plan is not a compensation plan at all, as it does not insure to either employer or employee a certain opportunity of settlement, as probably the greater percentage of injuries received are not due to the negligence of employers or the act of a fellow servant, and many injured persons would be unable to establish any legal liability; therefore, an employer who felt he was not legally responsible for the death or injury of one of his employees would not feel obliged to pay anything, or, at least, not the amounts provided for in the proposed law, and, on the other hand, if the representatives of an employee injured or killed considered there was legal liability on the part of the employer the compensation proposed would probably not be deemed sufficient. From the foregoing, and also for the reason it is proposed to introduce again the pernicious doctrine of comparative negligence, it is very much to be feared that the proposed law would greatly increase litigation instead of diminishing it.

With the larger engines of commerce there is an increasing number of serious injuries, largely met, however, by modern surgery, but in some cases the power to remedy is beyond human skill and the disability is permanent and complete; therefore, any plan of compensation should not restrict payments to any period of time.

After an experience in relief department work of some twenty-five years, the writer believes payments of lump sum more advisable than payments in instalments. The payment of half wage to a man injured to such an extent that he can not resume his former occupation is, in most cases, only providing for the necessaries of life. The payment of a lump sum permits him to earn a livelihood along other lines and to remain a respected and useful member of society. Hundreds of our men seriously disabled by disease or injury have made lump-sum settlements with us, engaged in business and been successful. It is seldom we hear of one who was unfortunate in the use of, or dissipated, the money paid him.

It would not be equitable for a compensation act to be compulsory upon the employer but elective with the employee, and this principle is recognized by the Minnesota Liability Commission, which consists of a lawyer, a manufacturer and the state labor commissioner. The Minnesota commission, acting under instructions of the legislature to draft bills providing for speedy remedy in cases of persons injured that would be fair to the employee, fair to the employer and just to the state, have given very careful study to this subject. While details are yet to be worked out, the commission has agreed that the right to sue for damages shall be eliminated and compensation shall be paid in all cases of injuries, except gross carelessness. Also, that the law is to apply to all who work, including agricultural laborers and domestic servants, and that contribution be made by both employer and employee. The Minnesota plan is equitable, but it raises a serious question. The right of a man to claim damages from another for a wrong done is inherent and is generally considered inalienable, but if society takes the right from a man and substitutes something else, the question is whether an individual who is injured has not the right to demand that society shall guarantee to him the substance of its substitute and not let him be dependent upon the financial stability of his employer or his employer's insurance companies. In short, "automatic compensation" as a substitute for the present right of election of remedies possessed by the individual brings sharply before us the question of state insurance.

The claim that something should be done for injured persons and their families is one that appeals to the sympathy of all, but injuries received in the course of employment are not the cause of the greatest amount of suffering and hardship. Disabilities and death from sickness or injuries received while not engaged at regular work cause the greatest suffering. Six railway systems—the Pennsylvania Lines East, the Philadelphia & Reading, the Baltimore & Ohio, the Atlantic Coast Line, the Pennsylvania Lines West and the Burlington—are operating relief departments; they employ over four hundred thousand men—nearly one-fourth of the railway employees in the United States; they are paying out annually some $4,000,000 in benefits, over one-half of which is on account of sickness or injuries off duty, and yet railroading is considered one of the most hazardous of occupations.

Compensation only payable in cases of injury where the employer is negligent or it is the act of a fellow servant, or reduced compensation where the employer's negligence is greater than that of the injured person, would probably mean compensation in less than half of the cases of injuries received at work and is begging the question confronting the country to-day. Generally speaking, when employers' liability or workmen's compensation is spoken of the public has in mind something like what is termed "automatic compensation"—that is, compensation for any injuries (excepting gross carelessness) received while on the premises of, or on the business of the employer, the employer being compelled to pay the compensation and the employee to receive it. The payments by the railway relief departments, as given above, show, however, that what is needed is some certain and sufficient provision for those members of society (and their dependents) who are physically unable to earn a livelihood from any cause not immoral.

In the railway relief departments, above referred to, the first one of which was established some thirty years ago, the basis is mutuality; the employee carries his protection against disability and death at a very low rate, the companies paying the expenses of operations and guaranteeing the solvency of the funds, so that the cash payments by the companies and facilities furnished about equal the contributions of the members. Acceptance of

*Abstract of a pamphlet.

benefits for injuries operates as a release. Had these companies only intended to escape liability for their torts, a plan would have been devised to protect the employees solely against injuries received in the service, but it was believed that helping the employee to help himself and protect himself and family against disability and death from sickness as well as from injuries received either while at work or otherwise, would be of mutual benefit, and the results have satisfied the officers of these companies that their belief was correct. More than fifty millions of dollars have been paid out in benefits—less than one-half of which was on account of injuries received while at work. It may be interesting to read from a decision of the United States Circuit Court of Appeals for the fourth circuit—case of Day vs. Atlantic Coast Line Railroad Company, decided April 16, 1910, this being the latest utterance of the courts upon this subject. The court said:

"The question of the validity of the contract, or contracts, in all respects similar to the one before us, has been so fully discussed by the courts, both State and Federal, and so uniformly upheld that *nothing new is open to be said.* It has been expressly decided by this court, in A. C. L. R. Co. vs. Dunning, 166 Fed. 850, in a well-considered and amply sustained opinion by Judge Morris, in which (the late) *Mr. Chief Justice Fuller concurred,* the same contract relied upon by defendant herein was upheld. The learned judge says, 'By a great number of carefully considered adjudications of the courts, both State and Federal, contracts of this character have been upheld and determined not to be against a sound public policy, but *distinctly beneficial to the employee, as well as wise on the part of the employer.*'"

While the general plan of these relief departments would probably not permit small employers to individually undertake the same work, yet legislation might authorize an association of small employers engaged in like industries that would permit any employer and his employees to similarly protect themselves.

The present plan in respect to settlement of claims for injuries, outside of these relief departments, is unsatisfactory and costly to the employee, employer and the state, but it is well, in most questions, to make haste slowly. It is more important to the employee than it is to the employer or to society at large that no move is made that is not practical as well as constitutional, and it is very much to be regretted that the individual states are each in their own way attempting to solve this problem, because chaos will be the result of individual state legislation on this subject, particularly among the employees of large railways and industrial corporations as well as the corporations themselves. The Burlington system operates in eleven states. On the one hand, we feel that we should not pay greater compensation in the case of an employee injured in Illinois than we would in the case of an employee injured to the same extent and under like circumstances in Wisconsin or Minnesota, in all of which states liability commissions have been appointed, and, on the other hand, it is not fair to one of our employees injured in Illinois, that under the law he would be entitled to less compensation than a man injured to the same extent under similar circumstances in Wisconsin or Minnesota.

The writer believes there is a sincere desire on the part of large employers and their representatives to be humane and to do what is just and reasonable, and so far as lies within their financial ability to avoid and relieve distress arising from physical sufferings of their employees; also that they will cordially welcome any law that will alike be fair to the employer, fair to the employee and just to the state, but he believes this cannot be accomplished by having individual action taken on the part of the different states; instead, he believes that the best interests of all will be subserved by the federal commission, recently appointed by President Taft, being furnished with all possible information upon this subject, both on the part of the employee and employer, and that we should lend our aid to the framing of a federal bill which, when enacted into law, might and should serve as a model for the various states, and thus, in one thing at least, bring about that most desirable of things—uniform legislation.

A NORWEGIAN SINGLE PHASE RAILWAY.

The Thamshavn-Lokken electric railway is a single track meter-gage line some 17 miles ling, with double track and sidings at the stations. There are seven stations, including the terminals at Thamshavn and Lokken. It is designed to handle both industrial and tourist traffic. At Lokken there are mines creating mineral traffic, and at Thamshavn is one of the largest timber works in Norway, while the line also passes through a valley which from the scenic point of view possesses many attractions for the large number of tourists who every year visit the country.

The single phase system is employed—this is the first railway

Passenger Train at Thamshavn Station.

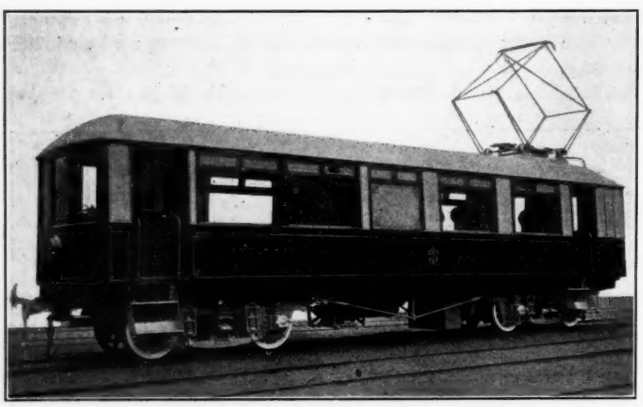
in Norway to use that system—power being obtained from a hydro-electric plant from which electrical energy is also derived for lighting Thamshavn and a number of villages, as well as for driving the Lokken mining machinery. The sub-station which serves the road is at Thamshavn, and has a motor generator plant transforming and converting a 15,000-volt, 50-cycle, 3-phase current to 6,600-volt, 25-cycle, single phase, for feeding direct to the overhead conductor. The Westinghouse single catenary system is used with bracket arm construction on wooden poles.

From Thamshavn, on Orkedals fjord, the line runs inland, skirting the river Orkla for some distance, after yhich it rises to Lokken. The track is laid with 44-lb. flat-bottomed rails (Vignales section) on wooden ties, and has ordinary track rail return, each joint being bonded with 50-sq. mm. copper bonds. From Thamshavn to Svorkmo where the line ceases to skirt the river Orkla, the gradients are easy and there are practically no curves; but from Svorkmo to Lokken there is a rapid rise with sharp curves.

The station buildings are of log construction with turf-covered roofs, and the lighting of these as well as of the platforms is effected from a small transformer in the trolley circuit.

The trolley wire is suspended at 5.5 meters above the track, except under a bridge at which point it is 4.3 meters. A 65-sq. mm. section grooved copper wire is suspended by stiff vertical hangers from a steel cable carried on insulators which are mounted on T-steel brackets attached to wooden poles supported by tie rods. It is nowhere more than 9 in. from the center line of the track, and the spans vary from 150 ft. on the straight sections to 68 ft. on curves. Though no feeder is yet required, there are section insulators fitted for dividing the line into six sections, in readiness for future necessities.

The equipment consists of three 20-ton electric locomotives for freight and passenger trains, and a saloon motor car for special purposes. The locomotives each carry four 40-h.p. Westinghouse single phase, series compensated motors mounted on two trucks. Each locomotive is capable of exerting a tractive effort of 6,500



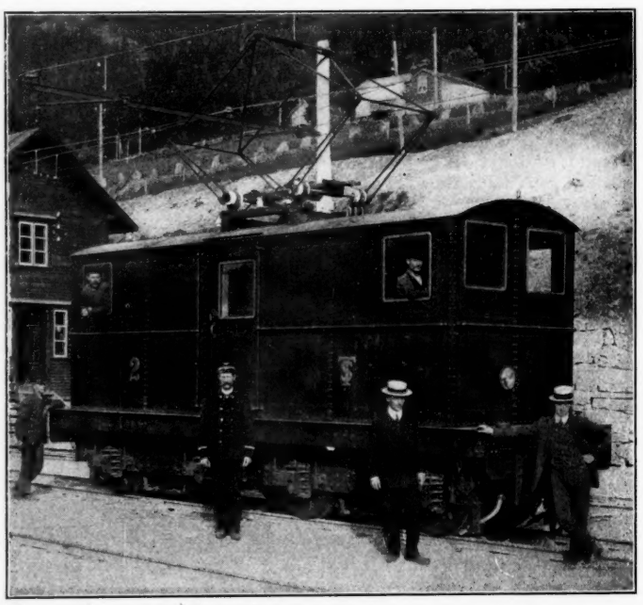
Saloon Motor Car.

lbs. at ten miles per hour, and a maximum tractive effort of 8,000 lbs. at starting. They are fitted with non-automatic air brakes, central couplings and buffing gear.

The pantagraph bow collector on the locomotive roof collects the 6,600-volt current from the overhead wire, and an insulated cable carries the current to an auto-circuit-breaker, and thence to the transformer which is suspended inside the cab. A grounded metal screen encloses the high tension apparatus. The four motors are arranged permanently in two groups, with two series in each group. Either pair of motors may be isolated separately. The electrically driven air compressor is fitted with an automatic governor and supplies air to a main reservoir, both for the brakes and for working the pantagraph bow. A hand pump is also provided for either raising or lowering the bow, should it happen that there is no air available on the locomotive.

The saloon motor-car when in running order weighs 23 tons. A special feature has been made of its luxurious upholstering and decoration, and it is, of course, electrically lighted and heated. The car is divided into a vestibule and driver's compartment at each end, with two saloon compartments separated from each other by a short passage. It measures 39 ft. 4 in. long and 8 ft. 6 in. wide. The body is framed with oak and sheathed with teak, carried on a rolled steel underframe supported by two swing bolster trucks, one of which is equipped with two 40-h.p. motors similar to that employed on the locomotives.

The contract for the complete electrical equipment of this road was carried through by the British Westinghouse Electric & Manufacturing Co., through its agents in Norway, the Elektrisk Bureau of Christiania. The locomotive bodies and frames and the saloon motor car were the work of English builders,



Twenty-Ton Electric Locomotive.

the remainder of the rolling stock being constructed by the Skabo Railway Carriage Works, Christiania.

The railway is owned by the Christiania Salvesen and the Christiania Tham's Communications Aktieselskab.

RAILWAY ACCIDENTS IN GREAT BRITAIN IN 1909.

The British Board of Trade has issued its "general report" in which the accident records of the last calendar year are briefly summarized. The principal statistics were printed in the *Railway Age Gazette* of May 27, page 1315. Only one passenger was killed in a train accident in the year. This was on July 2 (see below). Up to that date, there had been none so killed in more than 20 months. The number of passengers injured in train accidents in 1909 was 390. This is low as compared with the average of previous years. The number of employees killed in train accidents during the year was 82, which is equal to one in 70 of those exposed to danger. This average is the same as that for 10 years preceding.

The number of accidents inquired into by the inspecting officers during the year was 21, fewer than ever before. In the year 1900, 64 were investigated, including 48 collisions. Since that time, the number has been gradually diminishing. The salient features of the investigations of 1909 are given in the present report as follows:

Of the 21 accidents to trains inquired into in 1909, only one was attended with fatal results to a passenger (a clerk in the

service of the company), viz., the accident to a passenger train on the 2d of July, near Sudbury and Wembley Station, on the London & North Western Railway. One of the vehicles of the train was derailed owing to the signalman, through forgetfulness, shifting the points while the train was passing through them. In accordance with a recommendation of the inspecting officer, the company arranged for the provision of an additional locking bar between the signal and the facing points at which the accident occurred.

In eight of the other cases inquired into, the death of one or more of the company's servants was occasioned, 14 railway servants in all being killed by such accidents. The explosion of a locomotive boiler at Cardiff Docks on the Rhymney Railway in April caused the death of three servants of the company, the same number being injured. The inquiry showed that the safety valves of the boiler, which had been refitted during the previous day, were inoperative, causing the steam pressure to accumulate to a point at which the structure burst. After the accident, the company at once gave instructions that when steam is first raised in a boiler after the safety valves have been refitted, care is to be taken to see that the valves blow off at the proper pressure.

A question of some interest arose in the inquiry into a collision on March 5 between two passenger trains at Tunbridge Junction, on the South Eastern & Chatham Railway, whereby two employees were killed. The driver of one of the trains, which was proceeding from Redhill, ran past the junction signals, which appear to have been at danger. An inspector was riding on the engine in order to see that the train ran as nearly as possible to time, and the driver alleged that this had made him over-anxious. The inspecting officer expressed the view that the appointment of a third man to ride on an engine is generally undesirable, and that, when the object is to maintain time, the procedure is of doubtful advantage, unless it is anticipated that technical assistance may be required.

The derailment of a train near Friezland, on the London & North Western Railway, in August, caused the death of an engine driver and fireman and injuries to other persons. While the circumstances of the accident were to some extent conjectural, the inspecting officer came to the conclusion that the type of engine drawing the train, viz., a tank engine with six coupled wheels leading and a pair of radial axle trailing wheels, is not suitable for running at very high speeds, especially round a curve such as the one concerned in this instance, and the company promised that this opinion should receive due consideration. Another case of derailment, which did not cause loss of life, occurred in April to a Caledonian Railway passenger train near Crawford Station. The crank axle broke inside the boss of the left-hand driving wheel of the engine, with the result that the coupling rod also broke and the wheel became detached from the engine; the coupling between the engine and the tender gave way, and the tender and the whole of the train behind it were derailed. The fracture of the axle was attributed chiefly to the abruptness of the alteration in the diameter of the axle at the wheel seat, which has been found to be a cause of weakness in other cases. After the accident, the company gave instructions that all such axles fitted on passenger engines were to be altered forthwith and all new axles are to be made of the improved pattern.

Two of the train accidents inquired into occurred on electrically worked lines. By a collision at Marsh Lane Junction, between Liverpool and Southport, on the Lancashire & Yorkshire Railway, on January 21 a fire was caused, in which a third train, that came to a stand on an adjacent line, was involved. After the accident fears were expressed by some regular passengers as to the construction of the carriages used on the line, in which exits are provided only at each end. This class of vehicle was adopted by the company as being stronger than that with side doors and less likely to cause delay in leaving stations. The inspecting officer did not consider that, in all the circumstances of this railway, the use of end doors only leads to extra risk from fire to the passengers. The other accident to an electric train was a collision on November 18 on the Metropolitan District Railway between an empty carriage train and the buffer stops at Ealing Broadway Station, whereby the motorman and one of the conductors were killed. It appeared that the instructions to the men as to preparing the train and testing the air-brake before leaving the depot had not been properly observed on this occasion, and that there was no air pressure in the train pipe or auxiliary reservoirs, so that the motorman was unable to bring the train to a stand. In view of certain recommendations of the inspecting officer the company arranged to equip all motor cars and single end control trailers with train line air gages on the trailer end, so as to enable conductors continually to observe the pressure on the train line. They also stated that instructions were to be issued requiring motormen and conductors to make reports as to their having inspected and tested the equipment before a train is taken into service; and it was further proposed to give the men regular instruction in the working of the reverse and hand-brakes for use in an emergency.

THE CAMPAIGN AGAINST ACCIDENTS ON THE CHICAGO & NORTH WESTERN.

The management of the Chicago & North Western has entered on a campaign for the reduction of accidents, which is being carried on by methods that probably are unique. A large majority of railway accidents are due to the carelessness or recklessness of employees; most of them would be avoided if employees would give reasonably strict obedience to orders and rules. It is usually assumed that the only remedy for this condition is more rigorous discipline. The management of the North Western has decided that if the number of accidents is to be reduced discipline must be supplemented by action which will bring home to employees the fact that it is greatly to their own selfish interest and to the interest of their families that they shall give stricter obedience to the orders and rules, and shall in an organized way co-operate with the management to eliminate the causes of accidents.

To bring all the employees of the road to a clear and serious appreciation of what accidents have cost, are costing and will cost them, R. C. Richards, general claim agent, has since early in July been delivering addresses at the various division headquarters. There are 17 divisions, and when this article was written Mr. Richards had made addresses at 13 headquarters. He will continue to make them for as long as it seems desirable. Each of the meetings has been attended by the division officers and by large numbers of employees. The attendance of the employees has been purely voluntary, the only thing done to get them to come being to announce the time and purpose of the meetings on the various bulletin boards. Prior to beginning his talks to employees Mr. Richards held conferences with and made talks to the division officers alone.

For the purpose of the campaign against accidents the employees and officers are being organized from the lowest rank in the operating department to the highest. On every division there has been formed a committee of safety, each being composed of an engineman, a conductor, a fireman, a brakeman, a trackman and a switchman, who are appointed by the superintendent. Similar committees have been formed in the various division shops, being appointed by the master mechanics. In the Chicago shops the committee is appointed by the superintendents of shops and the superintendent of motive power and machinery. These committees in the mechanical department consist of one man from each shop. There has also been appointed a committee on safety for the large yards in Chicago, composed of switchmen who are appointed by the trainmaster of freight terminals. The personnel of these committees is changed constantly, one man on each committee retiring and a successor to him being appointed each month. Their duty is to investigate

the causes of accidents, to seek to get their fellow employees to do all they can to remove them, and, when any action needs to be taken which cannot be taken by employees, to recommend it to their superior officers. The purpose of the frequent changes of personnel is to familiarize with and interest in the subject of accidents, their causes and remedies, as many men as practicable, and thereby create among employees as much of the right kind of sentiment as possible. The committees meet monthly.

A central committee to receive the reports and supervise the work of the committee of safety has been appointed, composed of Mr. Richards; S. G. Strickland, assistant general superintendent, and W. J. Towne, engineer of maintenance. Matters requiring action which exceeds the authority of this committee will be referred to the general managers.

The most important work that has been done as yet consists of the talks to employees which have been made by Mr. Richards. His official position has given him an especially good opportunity to study the causes of accidents, particularly to employees, and he has for years taken a keen interest in it. Perhaps no railway officer in the country has devoted more thought to it. Besides being fully armed with the facts, he has a peculiar gift for stating them in such a way as to make a deep and lasting impression on his hearers. If he had not been a railway claim agent he might have been a preacher; and if he had been a preacher he would have shaken the sinners attending revival meetings over the burning pit in a way that would have stimulated them to begin at once bringing forth fruits meet for repentance.

An example of the way he brings home to employees their relation to and interest in accidents is afforded by the use he makes of statistics showing the number of persons killed and injured on American railways, and particularly on the Chicago & North Western, during the past ten years. After giving statistics for the railways of the country as a whole in one of his addresses he continued:

"This North Western railway, that we claim is the best road and has the best men, has done its share of the havoc. We killed in ten years 2,555 people—three regiments of soldiers. Seven hundred and thirty-five of them were your people—were your brothers, your sons, your fathers, your next door neighbors. In ten years we have managed on the North Western to have 735 funerals of employees. Seven hundred and thirty-five times we have had to call on the priest or the minister; and 735 times in ten years we have had to go to these awful funerals. Everybody here has been to them. We go into the house that is darkened by mourning, and we send some flowers or we try to send some message of sympathy, and when we go there we don't know what to say. We try to say something to that poor widow or poor mother or father who has lost a husband or son, and the words stick in our throats. Seven hundred and thirty-five times we have had to do that, we men on the North Western railway!"

At many meetings where Mr. Richards has talked along this line some of his hearers, who perhaps have had relatives or near friends killed in the service, have been reduced to tears, and everywhere he has been able to hold the serious and sober attention of his auditors throughout a talk lasting an hour and a half or two hours. Mr. Richards usually begins his talk with a remark that rather strikingly illustrates the extent of the increase in accidents on American railways. He remarks that the number of men employed, the amount of business handled, and the amount of the earnings of the railways have been increasing rapidly, and that this is especially true of the North Western, but one of the things that has increased out of all proportion to the increases in the number of employees and the amount of business handled is the number of accidents; and he points out that if the earnings of the North Western had increased as fast in proportion as the number of accidents on it, they would now be about $170,000,000 a year instead of $70,000,000.

"Think of it," he says, "every third day on the North Western there is one of you men killed, and every 50 minutes there is one of you men injured—not passengers, not outsiders, but employees. Now, it is you men who are paying this awful toll. And don't you think it is time to put a stop to it? The officers can't do it, the laws can't do it, there is no one who can do it but just you; and you are the people who can do it by turning over your hands. And do you know that every time we have one of these accidents the result is an increased risk to the rest of us because some new man who may be incompetent, who may be careless, and who certainly is inexperienced, has to take the place of the man who is injured or killed? We know that the result is going to be that the risk to the other men in the service is going to be increased, and at the same time the efficiency of the organization decreases. This is because the new man is not familiar with our way of doing business. I saw in the paper the other day that they were going to have a great meeting up in St. Paul on the conservation of the forests, of the water power, and of the untilled land. Now, we ought to have a meeting for the conservation of men, because men are much more important than things.

"We see in the papers a great deal of talk about railway accidents, and you would think from what you see and read that every man killed on a railway was killed in a train accident, some collision or some derailment. Now, we men who are working on the railway, who are employees, know that isn't so; that the little accidents that happen every day, that may be happening now over in the roundhouse, that may be happening up in Ishpeming, or in Green Bay, or in Chicago, make this awful risk. These accidents happen because somebody is thoughtless. Rarely if ever are they caused intentionally It is because we don't think what will happen if we don't do things according to the rules. The first rule in the book of rules says: 'In case of doubt, accept the safe course. Speed must always give way to safety.' And the last rule in the book of rules says: 'Remember, it is better to cause a delay than it is to cause an accident.' Now, that is what the company tells us and it is paying us for our time. Those rules were adopted by men of experience who rose from the ranks and who know from their experience the danger of taking a chance. We ought to have those rules pasted in our hats and we ought to comply with them, and if we would do that we would save 75 per cent. of these accidents the first month."

Mr. Richards relates many specific incidents to illustrate how carelessness causes accidents, citing the examples, among others, of the switchman who kicks a drawbar over when an engine is about 2 ft. from a car and has his foot mashed; of the car repairer who goes under a car without putting up a flag and is killed or injured because someone kicks a car against the car he is repairing; of the conductor who, being ordered to wait on a side track until a certain train passes, fails to ascertain by word of mouth, as the rules require, whether the train that passes is the one for which he has orders to wait, leaves the siding where he has been ordered to wait, and after it is too late to correct his mistake runs into the train for which he had "wait" orders.

Mr. Richards not only clearly and forcibly states the causes of accidents, but he also denounces vigorously the incomplete and often false reports regarding them which are sent in, and gives many specific instances of false reports which have led to trouble. He points out that the road cannot stop accidents unless its employees will co-operate with it in getting at the facts about them. "I remember," he says, "a case on the Madison division a little while ago, where a brakeman got caught between the man killers. We sent him out to inspect the car and he said there were no man killers on it. I don't know whether he ever saw that car or not, but when we sent a man up there they were on the car. Of course, he didn't put them on the car, and we didn't put them on it. Now, we don't want any such lying reports as that. If we didn't want the truth I could

make out the reports myself. I am something of a word painter myself, and probably I could have done it better than the car inspector."

One of the troubles is, he says in his talks, that employees are not familiar enough with the rules. "We ought to take more care in explaining to these younger men in the service the risk in it and what is going to happen if they do not comply with the rules. Why, when I was a little shaver running around the yards in Chicago, when the road was small, I knew nearly all the trainmen that came into the city, and when I would go into the dog houses, the cabooses, the roundhouses and the switch shanties, do you know what I would hear them talking about? They were talking about the rules, getting up hypothetical cases and arguing about them. They were telling about what a good engineman they had on their train and what a good run they had. What do I hear now? What do we all hear? There isn't any talk about the rules. They are talking about some timekeeper that didn't give them that extra 25 miles. They are talking about some 30 cents that's due them that they didn't get. You ought to get your pay; you ought to get every cent your schedule calls for. I get all mine calls for. But above all things you ought to talk about these rules and get them fixed in your minds, and talk about the accidents that happen every day and the causes of them. And the company ought to disseminate such information, so that when accident occurs from some cause similar accidents can be prevented. The company is just as much to blame as you are. It is just about half and half. But the company is trying to do its share now because its officers feel that something has got to be done to stop this awful waste of human life, and you ought to meet it half way and do your part."

It will be noted that the entire campaign is directed primarily to the reduction of accidents to employees. The reason for this is that 80 per cent. of the accidents that happen are suffered by employees, and it is assumed that whatever causes employees to be careful enough to reduce accidents to themselves will so improve the service as to proportionately reduce the accidents to all other classes of persons. It is felt also that no appeal to employees on the subject of accidents to other persons will be anywhere near so effective as an appeal to them relating to the subject of accidents to themselves.

It is too early yet to judge of what effects, if any, the campaign of the North Western's management for the reduction of accidents is having. All the officers in the operating department have become more or less interested in it and are co-operating in carrying it on. Even more interest, however, is being shown by the employees, who have manifested a gratifying disposition to co-operate with the management in a work which, of course, is mainly for their own benefit. There was a marked reduction in July, 1910, as compared with July, 1909. The number of persons killed on the North Western in July, 1910, was 25, as compared with 37 killed in July, 1909, a reduction of 33 per cent. The number of persons killed in July, 1910, was 781, as compared with 872 in July, 1909, a reduction of 15 per cent. The number of accidents usually increases as traffic increases, but the opposite was true in this case, the traffic in July, 1910, both passenger and freight, being larger than in July, 1909. These figures may have no significance. Data for a longer period will be required to show conclusively what results are being secured. But if the figures have any significance they indicate a marked tendency toward improvement.

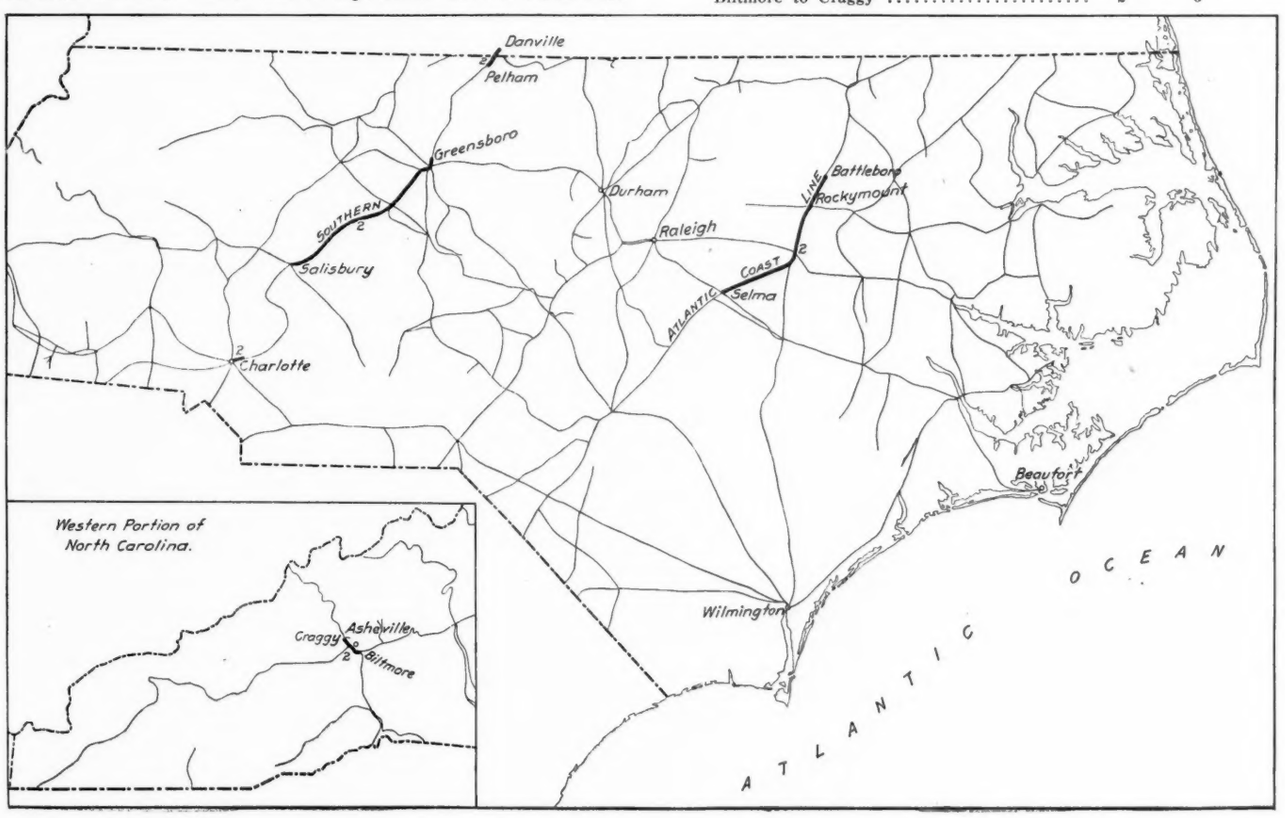
DOUBLE TRACK RAILWAYS IN NORTH CAROLINA.

The map of North Carolina, given herewith, is printed for the purpose of showing the location of all sections of railways in the state on which there are two or more main tracks. The termini of these sections are as follows:

NORTH CAROLINA.

Atlantic Coast Line.

	No. tracks.	Approx. miles.
Selma to Battleboro	2	50
Southern.		
Danville, Va. to Pelham	2	9
Greensboro to Salisbury	2	50
Greensboro, North	2	3
Charlotte to North Charlotte	2	2
Biltmore to Craggy	2	6



Double Track Railways in North Carolina.

Shop Section.

IF you have not yet started to work on your contribution to the engine house kink competition, which closes September 15, it is not too late to begin, although you have less than two weeks to get it into shape. Only two kinks are required to enter the competition. The first prize is $35 and the second $20. An extended notice of the competition will be found in the August 5 issue.

A COMPETITION on "The Care and Selection of Machine Tools and Shop Equipment" was announced in the August Shop Number and will close October 15. This is a subject which should appeal strongly to all shop foremen. The papers which are submitted need not use the above title as the subject, but may be on any phase of the question coming under that general head, such, for instance, as the maintenance and care of machine tools, the care and abuse of small tools, how a foreman should select the proper tools to recommend for use in his shop, the care of pneumatic tools, the maintenance of belting, the best way of keeping track and caring for the tools in roundhouses and car repair yards. These are only a few suggestions. As a matter of fact, the general subject covers such a broad field that any or all of our Shop Number readers should be able to participate. Prizes of $35 and $20 will be given for the two best articles; such others as are accepted for publication will be paid for at our regular space rates. The article need not be long, but should contain from five hundred to fifteen hundred words.

FIFTY-SIX kinks submitted by ten contestants in the recent shop kink competition, the result of which was announced in the August Shop Number, appear in this issue. These include kinks used in connection with lathes, drilling machines, slotters, shapers, planers, boring mills and milling machines. Also kinks from the erecting shop, boiler shop, smith shop, tool room, car shop and repair yard, and engine house. The number of kinks referring to car repair and engine house work is especially gratifying, indicating, as it does, an increased interest in the work of the Shop Number by the foremen in these departments.

G. H. EMERSON, now assistant to the general manager of the Great Northern, and H. W. Jacobs, assistant superintendent of motive power of the Santa Fe, were among the first to experiment with and extensively adopt oxy-acetylene for welding and cutting purposes in railway shops. Both the Great Northern shops at St. Paul, Minn., and the Santa Fe shops at Topeka, Kan., are equipped with central generating plants for the oxygen and acetylene, which are piped to the different departments in which they are used. The work now being done at St. Paul was described in a paper presented before the Master Blacksmiths' Convention by John Treacy, the blacksmith foreman, and appears on another page of this number. An extensive article on the use of oxy-acetylene at the Topeka shops, prepared by H. W. Jacobs, appeared in the June 17 issue. That the value of oxy-acetylene for use in railway shops is becoming quite generally recognized is evident from the papers on the subject which were read at the Master Blacksmiths' Convention; also by the article by Wm. C. Reyer and R. W. Clark in the August Shop Number and the description of its use, in the Erie car repair shops at Buffalo in the issue of May 6.

The use of a portable plant on wrecking cars for cutting the drawbars between derailed engines and tenders and for other purposes of this kind would seem to possess great possibilities. A most important feature of the use of oxy-acetylene, which has developed gradually, is the reclaiming of various parts of locomotive and car equipment which have become badly worn, cracked or broken. While the saving in the value of the material amounts to considerable, the greatest saving is often in the shorter time the equipment is held out of service while the necessary repairs are being made.

THE "old railroader" talks plainly and straight from the shoulder in his article on "How a Foreman Can Promote Shop Efficiency.' Many of the bad practices mentioned have been done away with on the more progressive and better managed roads, but they are still far too common. It is in improving such conditions that the ambitious foreman finds his opportunity. In many instances the desired changes may be brought about by good management on his part and without having to appeal to his superiors for additional authority or support. In other cases, such, for instance, as when it is desired to pay a higher rate in order to get an inspector better fitted for the work, it will be necessary to have sufficient data at hand to show good cause for the change. It hardly seems possible that an officer will refuse such a request, if it can be clearly shown to pay good returns within a reasonable time. It would appear that very often such requests are turned down because the foreman fails to make a sufficiently forcible statement of the case to carry conviction. The foreman who usually gets what he wants is the one who goes to his superior with a carefully prepared statement of the case showing as clearly and forcibly as possible the probable results which will follow the proposed improvement. Then, if it is not approved, he goes back to his work—not discouraged, but on the lookout for additional arguments to strengthen his case. At the first good opportunity he takes it up again and keeps at it until he finally gains his point, or is proved to be in the wrong.

IN spite of the extremely hot weather during the middle of August the two mechanical department conventions which were held at that time—the Master Blacksmiths' and the Traveling Engineers'—were more aggressive and effective than some of their sister organizations whose meetings were held under more comfortable weather conditions. The Master Blacksmiths' convention, a report of which appears in this number, held two sessions a day, and the members worked as hard or harder than if they had been on duty in their shops. The attendance was good at all of the meetings right up to adjournment. A rather unique custom followed by this association is the formal reception of new members. As their names are read off they rise and go to one side of the room, after which a recess of five minutes is taken in order to welcome them. Another rather unique practice is that of having the tellers stand about the presiding officers' desk and call out and check the name on each ballot as it is counted. The effect on the audience when the vote was close or when the ballot on the meeting place for next year was being counted was interesting. Probably the most valuable papers presented were those on oxy-acetylene welding and cutting, although the papers and the discussions generally were all good.

FUTURE COMPETITIONS.

IN addition to the engine house kink competition to close September 15, and the one on the care and selection of machine tools and shop equipment to close October 15, three other competitions will be held before January 15, 1911. They were announced at length in the August 5 issue and are as follows:

A competition on car repair kinks will close November 15. Any kink used in car repair shops or yards for either freight or passenger cars, or at terminals in connection with the cleaning or repair of car equipment, may be included. Two or more kinks may be submitted, but the judges will base their decision

on the best two in each collection. The prizes will be $35 and $20 for the best two collections. Other collections accepted for publication will be paid for at our regular space rates.

On December 15 a competition will close on "Increasing Shop Output." The same conditions will govern as for the competition on "The Care and Selection of Machine Tools and Shop Equipment," to close October 15. Tell us how you increased the output of your shop, or department, by improving the organization, rearranging the equipment, or handling it to better advantage. The competition should bring out such articles as a good shop schedule and the result of its installation, a successful shop despatching system, the arrangement and operation of a first-class bolt manufacturing plant, the best flue handling plant, how a car repair yard increased its output by better methods, how a better system of organization and operation was instrumental in improving the conditions at an engine house, or how the same results were secured with the same equipment, but smaller labor costs. These few subjects are presented merely as suggestions. There are at least a hundred more equally as good.

The competition to close January 15 will be on shop kinks and will include any kink used in connection with the repair and maintenance of locomotives or cars of all kinds. The prizes will be $50 and $25 for the best two collections of three kinks. More may be submitted, but the award will be based on what the judges consider to be the best three kinks in each collection. In this, as in all the above announced competitions, kinks or articles which do not win a prize, but are accepted for publication, will be paid for at our regular space rates. Contributions may be entered in any of these competitions at any time between this and the closing date.

POSSIBLE ECONOMIES OF HIGH-SPEED STEEL.

As soon as the mechanical world realized the possibilities of high-speed steel, it was eager to use it, and a common expression in the early days was to the effect that it had so far outstripped the capacity of the old machine tools that it remained for the builders to redesign their tools and make them capable of driving the steel to the limit of its capacity. This, of course, quickly followed in response to the demand and machines of great power were soon on the market, and things were once more in equilibrium. The point was recently suggested by H. I. Brackenbury, in a paper before the Institution of Mechanical Engineers, in England, that possibly it was uneconomical to invest too heavily in machine tools capable of doing a great amount of work, and that it was also possible that the ease and rapidity with which metal could be removed was leading to a waste, not only of the metal so removed, but of the power required to remove it, and that if a greater expense were to be incurred in forging more closely to dimensions, the extra expense would be more than saved in material and power.

The conditions resemble those arising under similar circumstances elsewhere. It is like the use of a bicycle. The rider is apt to travel much farther than is necessary in order to go from one point to another, because it is so easy, and he compares the total effort with that of walking. So we are apt to do more cutting than is necessary because the high-speed steel enables us to do so and still outstrip the time that would be needed to do less work with the old carbon steel. We have not yet become quite so thoroughly habituated to the new order of things that we take advantage of the fact that more power is required to remove a thin wide chip than one of double the thickness and half the width. Also, the power required to drive the tools being imponderable and not discernible by the workman, he does not always pay due regard to the fact that tools with blunt cutting angles require more power than those with sharp cutting angles, to remove the same amount of material. And, finally, we should bear in mind that the total power used for a given cut, including that absorbed by friction in the machine, increases at a smaller ratio than the increase in the cutting speed. In other words, less horsepower is used per pound of material removed at high speeds than at low speeds.

Mr. Brackenbury emphasized this lack of appreciation of the true economy of the use of high-speed steel by urging that it might well be an uneconomical proposition to purchase a machine capable of a high duty, unless there were to be sufficient work to keep it running up to capacity. For if this were not the case, the overhead charges on a too expensive machine might more than offset its seeming saving, and also, that the fact that a ton of cuttings can be made at a low labor cost by the use of highspeed steel should not make us forget that someone has to pay for the ton of material and the power required to remove it. According to Mr. Brackenbury there is only one way in which the full saving made possible by the use of high-speed steel may be made, and that is by setting aside certain machines for roughing and for roughing only. It is quite unnecessary to replace all or even many of the old machines, which have quite enough power to carry the finishing cuts at good speed, nor is it desirable to use either the same class of machinery or of labor for roughing out as for finishing.

The amount of power required for the driving of high-speed steel has been lost sight of, because of the ease with which the steel apparently does its work, and this in spite of the fact that it was driven home at first by the inability of the older tools to pull the cut. But as soon as the heavier machines were installed, and the maximum cut could be taken, we forgot that the high-power consumption still remained and was an unremitting tax on the engine and eventually the coal pile. The paper referred to cites the following examples of increases of horsepower provided:

Turret lathe for 2¼-in. bars increased from			2	h.p. to	10	h.p.
Lathe, 6-in. center	"	"	1	h.p. to	4	h.p.
" 10-in. "	"	"	2½	h.p. to	10	h.p.
" 14-in. "	"	"	5	h.p. to	20	h.p.
" 36-in. "	"	"	20	h.p. to	60	h.p.
" 60-in. "	"	"	30	h.p. to	100	h.p.
Slotting machines, 12-in. stroke	"	"	9	h.p. to	15	h.p.

Special cases of high power are:

12-in. center lathe.....50 h.p.
18-in. center lathe.....60 h.p.

The 18-in. center lathe took a test cut on steel, 1½ in. deep with ¼-in. feed and at a cutting speed of 28 ft. per minute, the consumption of power being upward of 80 h.p. In fact, there seems to be no upper limit to the amount of power that can be applied to a machine.

This point of the necessity for saving in power consumption on heavy work is one that cannot be emphasized too strongly. A few years before the advent of high-speed steel, it looked as if the milling machine would drive the planer out of the race for heavy roughing work, as it could do the same amount of work in one-third the time. But the power required is so serious an item that it has been found, with high-speed steel, to be more economical to use the planer, especially in view of the great advance that has been made in the cutting speed of these machines, and this, coupled with the rapidity of the return stroke, which has a range of 90 to 180 ft. per minute, has made the planer a most efficient tool for the removal of metal. On the other hand, while the power put into the milling machine has been greatly increased, it still requires a great deal more for the removal of a given weight of metal, as compared with the lathe or planer. We have already noted that it requires more power to remove a broad and thin chip than a narrow and thick one of the same sectional area. A milling cutter may be compared to a lathe tool with a very long cutting edge removing a thin wide chip with the corresponding increase in power consumption.

So, while high-speed steel has already effected wonderful economies in the labor involved in the performance of machine work, there is still a wide field of investigation open for the determination of the best means of utilizing the power that must be used for driving the tools that do the work, and of so adjusting or regulating the costs of power, labor and overhead charges that they will bear the proper relationship to each other, and their total shall be that of the highest degree of economical operation and the lowest cost of unit output.

MECHANICAL ARTICLES DURING AUGUST.

FOR the convenience of Shop Number readers who may wish to look up mechanical articles that have appeared in the *Railway Age Gazette* since the Shop Number of August 5, the following outline of such articles has been prepared:

The Charcoal Iron Car Wheel. It has been claimed that the cast iron wheels of to-day are inferior to those made years ago. An attempt has been made to locate wheels made according to the practices of 30 years or more ago, and compare the service rendered by them with that of wheels made to-day.—August 12, page 273.

Mikado Type Locomotive for the Atlanta, Birmingham & Atlantic. These locomotives weigh 260,000 lbs. and have a tractive effort of 50,800 lbs. Illustrated. August 12, page 282.

A Machine Shop on Wheels. A brief illustrated description of a traveling machine shop car on the North Coast Railroad, for making repairs to locomotives and other equipment. August 19, page 312.

Vanadium in Cast Iron Locomotive Cylinders. As the result of a two-years' test of a pair of cylinders the New York Central has specified vanadium cast iron cylinders on 183 new locomotives built during the past eight months. The article is an abstract of a paper read before the New England Foundrymen's Association by Geo. L. Norris. Aug. 19, page 312.

The Cambria Steel Works. This article includes a brief study of the development of the Bessemer and Coffin processes of steel treatment; and considers the resources, plants and output of the Cambria Steel Works. Special attention is given to the steel car manufacturing department and to the hospital for employees. August 19, page 316.

Traveling Engineers' Convention. A 4½-page account of the annual meeting at Niagara Falls. Special attention is directed to the reports on fuel economy, education of firemen, superheating and lubrication. August 26, page 350.

Proposed Safety Appliance Standards. A hearing is to be held on these proposed standard before the Interstate Commerce Commission on September 29. To give some idea of the extent of the changes from the M. C. B. standards, the proposed standards for box and house cars are reproduced on page 356 of the August 26th issue. Editorial comments appear on page 343 of the same number.

Letters to the Editor.

SHOULD OIL HOLES ON TOP OF DRIVING BOXES BE OMITTED?

Cardiff, Colo., July 28, 1910.

To the Editor of the Railway Age Gazette:

You might as well shake a red blanket at an enraged bull and expect him to stand still as to expect no expressions of opinion from many enginemen and mechanical men on this subject.

In this day, when the mileage and oil account go hand in hand, I am convinced that oil holes on top of driving boxes are not necessary. From my personal experience and observation, the packing on driving boxes becomes a solid mass through mixture of dirt and oil, and unless the packing on the top of the box is changed often, the oil placed thereon is entirely lost; should any of it reach the oil holes, it is apt to carry a certain amount of sand and grit to the journal. Watch the average engineer in oiling his engine. With a long-spout oil can he will dig around on top of the driving box and stir the packing up (he says); in reality he is stirring up the dirt, and incidentally trouble for himself and the operating and mechanical departments.

Then comes the difference in the lubricating qualities of the different grades of oil. Most railways use one grade of oil for driving boxes and another for the machinery, the lubricating oil for journals being of a heavier grade than that for machinery. What is the result when the lighter oil is poured on top of the boxes and the journal is lubricated from the cellar with a heavier grade of oil? If the lighter oil does reach the journal through the oil holes, it will remove the heavier lubricating oil from the journal, and the result expected of the heavier oil in the cellar is lost.

What attention, if any, will be necessary on the part of the enginemen and the mechanical force to improve the lubrication of driving boxes?

First, the mechanical department should see that the cellar is well packed with good soft springy wool packing, properly saturated. Then a record should be kept and a systematic examination made of the cellars on engine trucks and driving boxes. This record and examination to be based upon mileage and service.

Second, the engineer should keep the oil can off the top of the driving box. With the exception of what oil is placed for the shoe and wedge lubrication, oil should not be put on top of the box. Again, close attention on part of the engineer for the danger signal which the journal always hangs out. An engineer should no more run by this signal than any other danger signal. When the journal shows a rise of temperature there is something wrong, and it certainly needs attention.

What good will come of omitting the oil holes on top of the driving box, outside of preventing the heating of the box caused by the stirring process? Engines will be able to make more mileage on a given amount of engine oil, and if proper methods are followed with the packing, which is removed from the cellar, the car or journal lubricating oil will very easily make the mileage and engines will be run within the allowance; yes, and save the railway company money on the investment.

W. E. M'ELDOWNEY,
Division Foreman, Colorado Midland.

NON-FREEZING AIR-BRAKE HOSE.

Ottawa, Ont.

To the Editor of the Railway Age Gazette:

I have read with much interest the article on "Tests to Determine the Effect of Low Temperatures on Air-Brake Hose and Gaskets" on page 1254 in your issue of May 20, 1910. Several years ago you published a short article of mine on a non-freezing air-brake hose. I find on looking up my office copy that the tests of this special hose, made to my specification, extended over a period of eighteen months, with splendid results.

Necessity has always been the mother of invention; the serious trouble we were having with the air line on log trains caused me to question the suitability of the regular standard hose for satisfactory service in low temperatures. It was not necessary to make tests with springs to learn how the regular hose acted in a temperature of twenty to thirty degrees below zero. We had the object lesson before our eyes on the trains, and we had the results in hours of delay on each trip, with many skidded wheels to change and generally unsatisfactory conditions. The substitution of the new non-freezing hose for the standard, without making any changes in gaskets, eliminated our troubles at once.

The winter following that during which we tried these on log trains we had ballast trains working during the cold weather, the cars being equipped with the standard hose. To get anything like satisfactory service, the men in charge changed the hose each trip, keeping one set in a warm shanty to dry out ready to be applied before the train went out. This was not good business, and we again tried the non-freezing hose, with success.

The author of the article on page 1254 of May 20 speaks of soaking the hose to secure moisture and seems surprised at the small quantity of water taken up. I am of the opinion that this is not a satisfactory test, as my experience has convinced me that a hose in actual use will take up much more water under pressure than it will from mere soaking. In actual use in low temperature the water is present from condensation, and the pressure will drive it into the hose.

This question of a non-freezing hose is of great importance to railways operating in cold countries, and I trust that it will now receive the attention it deserves. I failed in arousing interest, outside of our own road, when I called attention to the matter some years ago, but I hope Mr. Hatch will be more successful. One of the reasons why I failed was that I could not get a perfectly satisfactory non-freezing hose that would conform in its outside measurements to the M. C. B. standard. My hose was made of much finer material than the regular article, and while it was quite as strong to resist bursting pressure, the wall was much thinner. I think some of us would be glad to know how Mr. Hatch got around this.

E. J. M'VEIGH,
Storekeeper, Grand Trunk.

Shop Kinks.

TWENTY-SEVENTH COLLECTION (First Prize).

BY C. J. CROWLEY,

Piece Work Inspector; Chicago, Burlington & Quincy; West Burlington, Iowa.

CHUCKS FOR PLANING CYLINDERS.

The chucks, shown in the photograph, Fig. 1, and the drawing, Fig. 2, are made to accommodate all sizes of cylinders from 18 in. to 25 in. in diam. The steps on the cones fit the counterbores of the different size cylinders. The set consists of two end and two center chucks. One of the center chucks is made long (the one shown to the right in Fig. 2), since some of the cylinders have frame fits extending beyond the ends of the cylinders. If the frame fits do not extend beyond the cylinders,

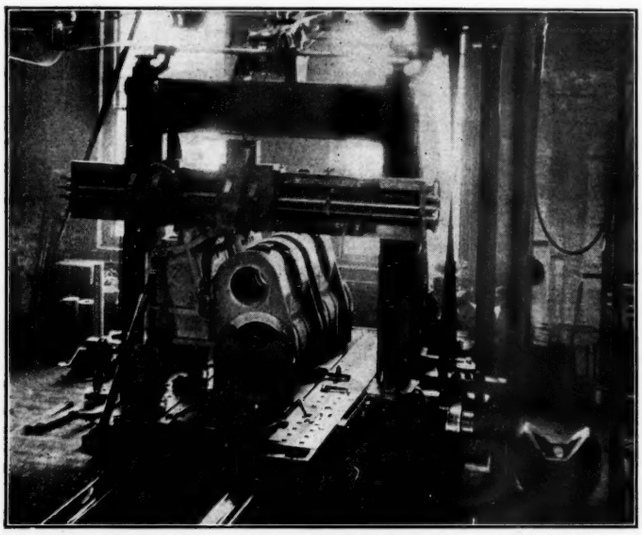


Fig. 1—Cylinders and Chucks in Position on Planer.

a short center is used (about 9 in. wide over all except for the base, which is 12 in. wide), bringing the cylinders closer together and saving considerable time in planing. The gap at the top of the chucks is provided to lighten them, and is also useful in placing the two large bolts which are used to draw the chucks tight against the cylinders. The chucks should have the steps on the cones machined first, after which the center hole should be bored out. They should then be placed on a mandrel and finished to fit the slots in the planer bed. With these chucks, it is possible to set up and bolt a pair of cylinders ready for planing in one and a half hours.

SHAPER RADIAL CHUCK.

This chuck, shown in Fig. 3, was designed to plane the front half of main rod brasses. These are circular in shape, forming practically one-half of a bushing, although some of them have flat sides. The ends of the chuck for this latter type are designed accordingly, as shown by sketch Y. There are many chucks of this general construction, but most of them are heavy

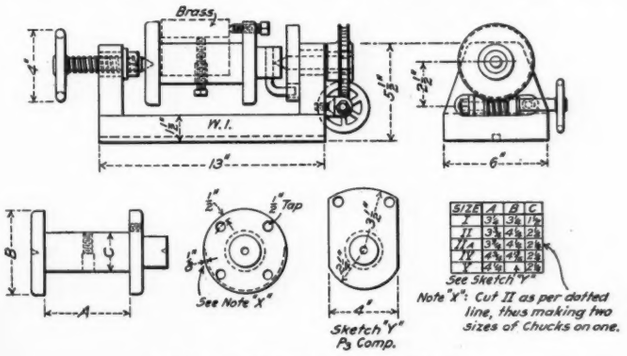


Fig. 3—Shaper Radial Chuck.

and it is necessary to remove the shaper chuck from the table when using them. This chuck is held in the shaper chuck while in use, saving considerable time in changing from one class of work to the other. When planing the brasses for the front end of the main rod, the ordinary shaper chuck is used on the back half; the front half can then be machined in the radial chuck without removing the shaper chuck. This chuck can also be used for other work, such as dies, etc., on either straight or taper work. For taper work a wedge is placed under one end of the shaper chuck.

DRIVING BOX BRASS CHUCK FOR SLOTTER.

This chuck, Fig. 4, is made in three sizes; one for 7 to 7½-in. x 8-in. journals; one for 8 to 8½-in. x 10-in. journals, and one for 9 to 9½-in. and 10-in. x 12-in. journals. There are also three sizes of gages, one for each chuck. The frames of the gages are constructed of ⅛ in. steel ½ in. wide. The small piece with the 4¼ in. radius, shown at the right in the drawing, is used with the smaller size gage only. The circle of the box is first calipered and the points on the gage set accordingly. The gage is then laid on top of the brass and the cutting tool is set to the gage points, making allowance for the finishing cut. After the radius is slotted, the gage, which meanwhile has been fitted to the box to get the proper angle of the dove-tail, has the small angle piece of ⅜ in. round iron fastened against the middle point of the gage. The projecting arm of the angle piece is pressed against the brass and the dove-tail is scribed. The assembled view of the gage shows it arranged for this purpose. After the dove-tail is slotted to the line, the gage is placed on top of the brass and a scale is held against the dove-tail to check the work. This tool has been used in slotting boxes for several years; but one operation is required

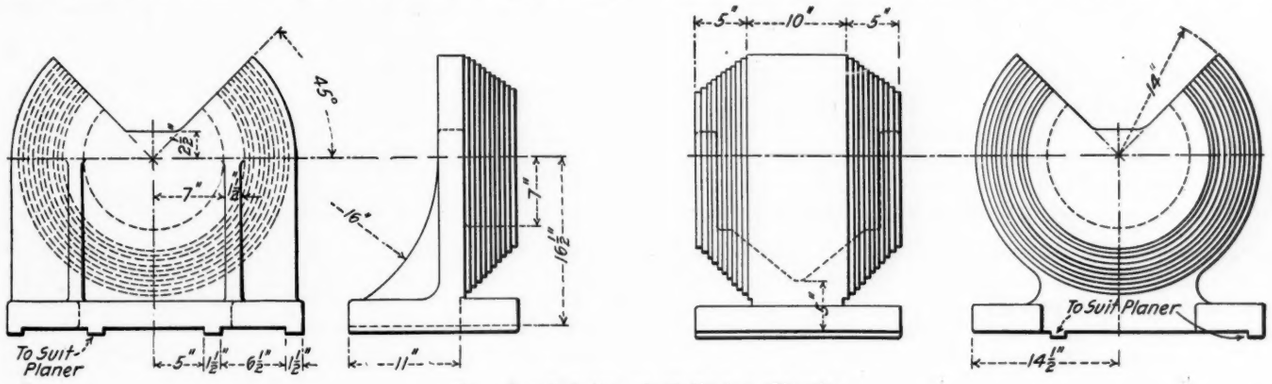


Fig. 2—Details of Cylinder Chucks.

instead of three or four, as when the brasses are turned in the lathe, after which the dove-tail is cut on a shaper or slotter.

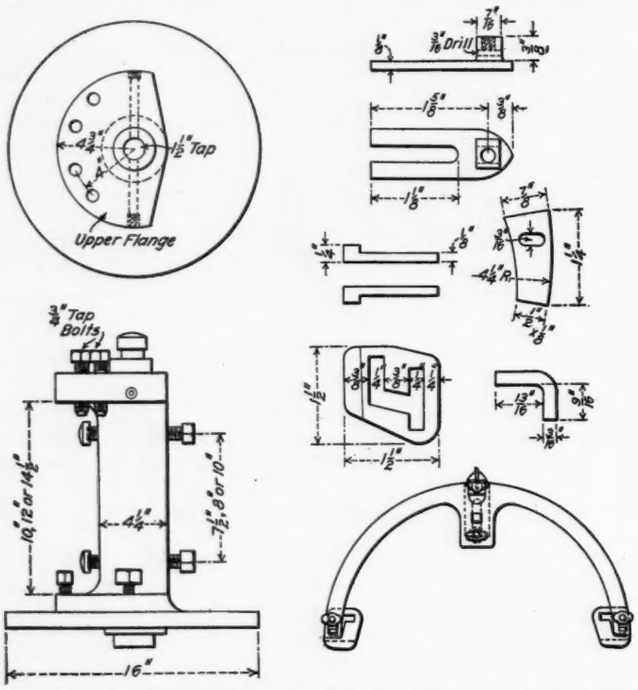


Fig. 4—Driving Box Brass Chuck for Slotter and Gage for Laying Out Brasses.

Brasses are slotted and pressed-in in 35, 40 or 45 min., according to the size, making perfect fits without filing.

CHUCKS FOR DRILLING AND REAMING BUSHINGS.

These chucks, Fig. 5, are bolted to the side of the drill press table. Bushings are usually made from bars of iron or steel, after the stock has been notched a little deeper than the hole to be drilled, the drill cutting off each bushing at the notch. Bushings made in this way cost about half as much as forged bushings or tubing, which means a very large saving, as all the valve motion, equalizers, equalizer fulcrums, spring hangers, air-brake hangers, etc., are bushed, using from 80 to 100 bushings on each engine.

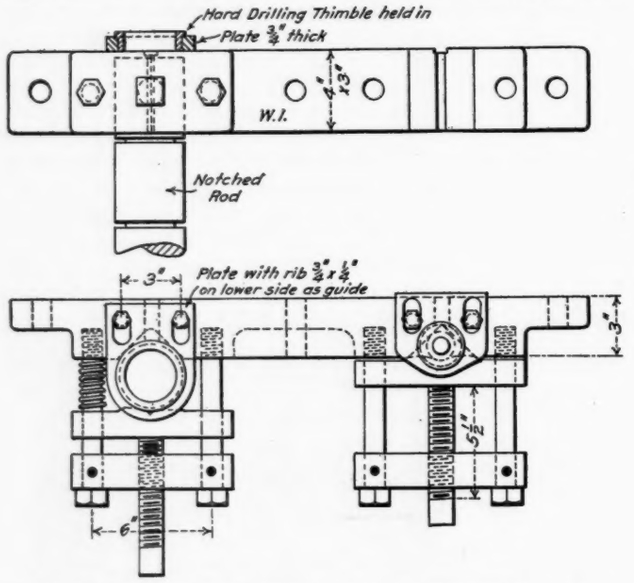


Fig 5—Chucks for Drilling and Reaming Bushings.

BOLT DRIVER.

A simple driver for a bolt lathe is shown in Fig. 6. These drivers are made in sets for the different sizes of bolts to be turned. Two holes are tapped in the face plate and studs are screwed in to hold the drivers, so that they may be easily and quickly placed or removed. The driver has many points of advantage over the old style driver, as it adjusts itself to the head of the bolt, provides a double drive and keeps the lathe balanced, which is necessary when running at high speeds. The best way in which to make these drivers is to plane a long bar of steel to shape and cut off the drivers to the different widths desired; hardening will increase their life about 300 per cent.

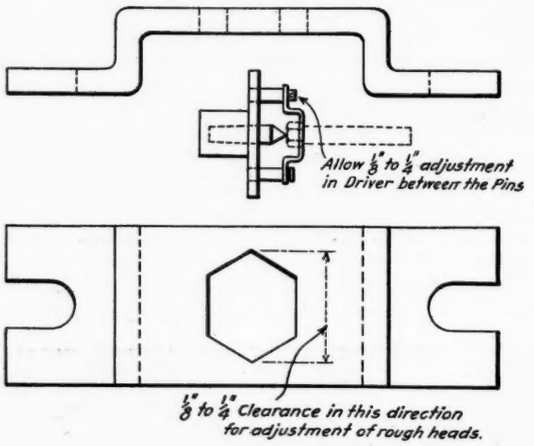


Fig 6—Bolt Driver.

DOVE-TAILING AND COUNTERBORING TOOLS.

The dove-tailing tool shown in Fig. 7 is for use after a hole is made with an ordinary flat bottom drill. When the end of the dove-tailing tool reaches, and is pressed against the bottom of the hole, the cutter is forced out, making the dove-tail such as is often used to anchor babbitt in crosshead shoes, driving boxes, etc.

The counterboring tool, shown in the same illustration, was designed especially for reaming frame bolt holes of cylinders. As these holes are 18 in. long, they are very difficult to ream. With this tool the center of the hole is counter bored for about 6 or 8 in., after which the holes can be reamed in about half the time formerly required. In operation, the cutting tool is first set and fastened with a set screw. The milled nut is then screwed down so that the cutter does not project beyond the body of the tool. The bar is then entered in the hole from the bottom; the motor is started, and the tapered head holding the

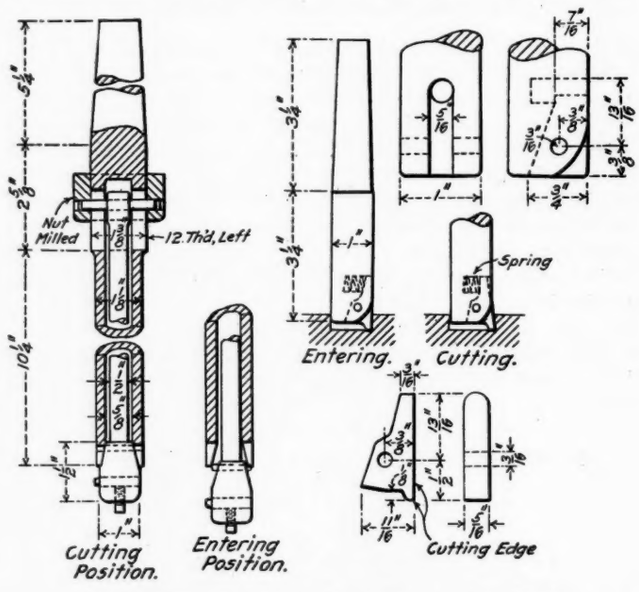


Fig. 7—Dove-Tailing and Counterboring Tools.

cutter drawn up into place by tightening up the milled nut, forcing the cutter into the metal.

ADJUSTABLE CUTTER HEAD FOR DRILLING.

The cutter head, shown in Fig. 8, is a simple and strong tool for cutting 6 to 16-in. diam. holes from the solid, after drilling the hole for the center pin. It is a good tool for cutting out side rods, working from either side. This method permits the use of short and stiff tools.

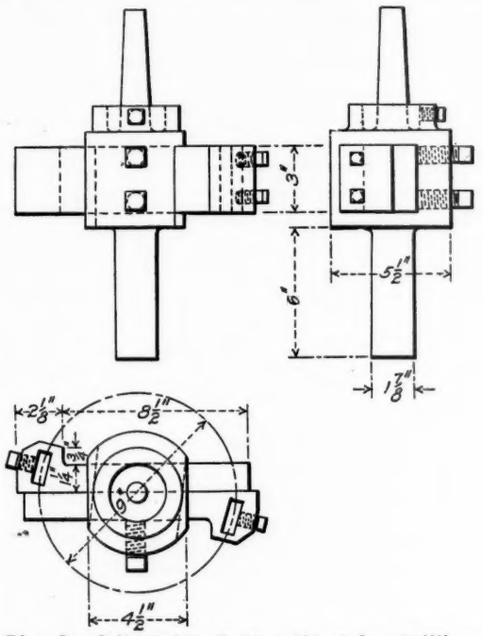


Fig. 8—Adjustable Cutter Head for Drilling.

BORING HEAD FOR DRILL OR BORING MILL.

The boring head, shown in Fig. 9, has three tools held in place by the bolt in the center. Each tool is tapped at its inner end for a small bolt to provide adjustment as the cutter wears. A sliding gage should be used to grind and adjust these cutters, keeping each set at the same length. Several different sizes of holes can be bored by having small blocks to place back of the screws in the cutter head. The head is also arranged for using a facing cutter. It is possible to chuck, bore and face nine eccentrics with 9 in. holes, 3¾ in. deep, in one hour.

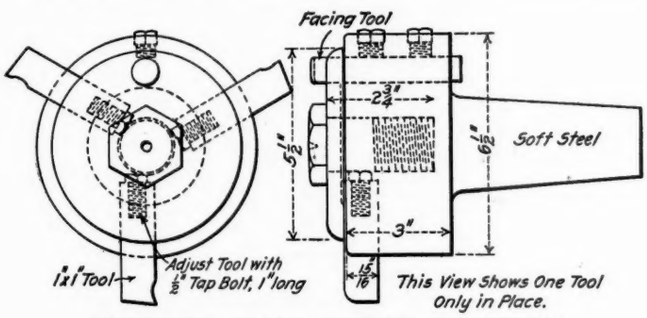


Fig. 9—Boring Head for Drill or Boring Mill.

HOLDER FOR TIRE FINISHING TOOLS.

A holder for tools to finish the contour of tires is illustrated in Fig. 10. The object of the holder is to use steel from stock sizes requiring no machining except on the cutting edge. The dotted line shows the holder as it is made for the use of a tire flange finishing tool. When the tools become dull they are easily and quickly removed and replaced by sharp ones. As the cutter wears it may be moved forward by placing shims behind it. When it becomes too short for use, the steel may be drawn out and used for smaller tools. The clamping plate, shown dotted, may be used to advantage in holding the cutter more rigidly than is possible without it.

CHUCK FOR TURNING SWITCH STAND STEMS.

The chuck, shown in Fig. 11, is made to fasten on the side of a drill press table, or, where the table is not suitable for this purpose, it may be bolted to an angle iron fastened to the table, and high enough to allow the hook on the switch stem to clear the table. The round block, which fits in the body of the chuck, has a small flange on the outer edge, which keeps the block from dropping out when it is turned. The hole for the milling cutter is located near the outer edge of the block so that any throw of switch stem used on a Ramapo or on a quarter arch switch may be obtained. A set screw on the side of the chuck holds the eccentric block in place. When it is set for a certain throw, and a number of stems of the same throw are to be handled, a mark should be made at the edge of the hole in the body of the chuck and on the outer edge of the block. The milling cutter used with this chuck is cupped out at the top, and a small hole is drilled to the hole in the center of the cutter. This provides for the oil or cutting compound reaching the cutting edge.

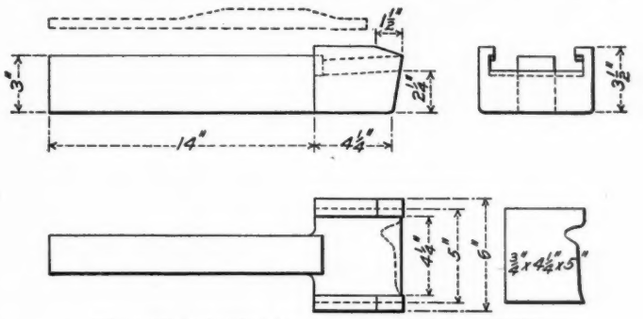


Fig. 10—Holder for Tire Finishing Tools.

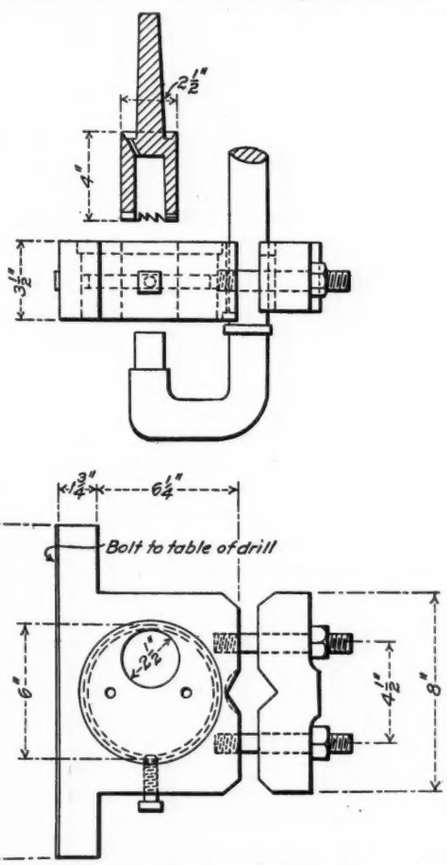


Fig. 11—Chuck for Turning Switch Stand Stems.

HAND CAR WHEEL PRESSES.

The device for pressing on hand car wheels shown in Fig. 12 has a long bar in the center, resting on jack screws to provide

for adjustment. A V is cut on the top of the bar and the axle clamps loosely to it, so that it will slide while pressing on the wheels. As the wheels are pressed on by the ratchet jack this bar and the clamps prevent the axle from springing.

The device for removing the wheels, also shown in Fig. 12, is made from old pieces of engine frame. These pieces are set in blocks of the proper height. The forgings are held together

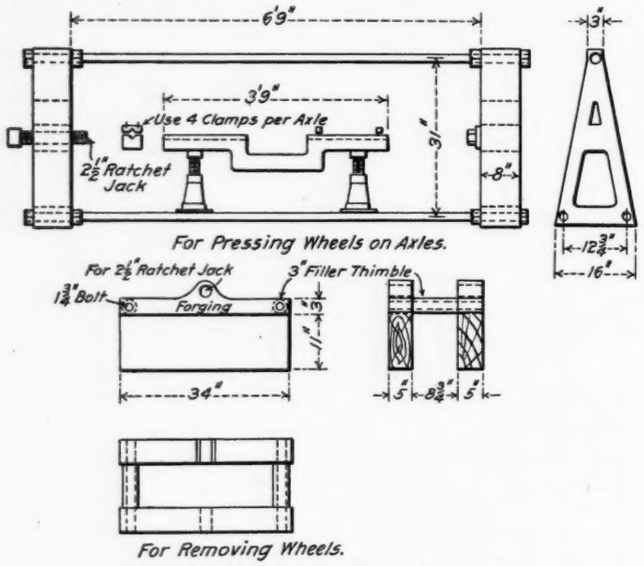


Fig. 12—Hand Car Wheel Presses.

with 1¾-in. bolts with 3-in. thimbles between. One forging is arranged to take a 2½-in. ratchet jack which is forced against the end of the axle; the other forging is cut out opposite the hole for the screw so that the axle may rest in it. The forging is cut to take the largest axles and for the smaller ones a V-shaped collar may be slipped in between it and the axle. The screw jack does not fit directly against the axle but bears against a pin or block, which is a little smaller in diameter than the axle.

TWENTY-EIGHTH COLLECTION (Second Prize).

BY E. G. GROSS,
Master Mechanic; Central of Georgia; Columbus, Ga.

TOOLS FOR WELDING GREASE AND OIL CUPS ON MAIN AND SIDE RODS.

The tools shown in Fig. 13 are used successfully in welding finished grease and oil cups on main and side rods. An inside and an outside welding tool are used and a few light taps on each with a small 6 or 8-lb. hammer will make the weld Sand or some other welding compound should be used to insure a good weld; it is important that the heated end of the rod extend over the side of the anvil during welding to avoid damage to the rod. The grease cup is made of soft steel from bar stock and is finished in a turret lathe. In making the weld, the inside tool should always be used first and the outside one should follow it as quickly as possible. After a few trials any blacksmith can successfully handle these tools and weld oil cups to rods at the rate of five per hour without damaging the threads in the cup or disfiguring the cups or rods. These tools have been in use at the Columbus shops for several years with splendid results. The parts are heated to a welding heat in a common forge using a good grade of coal.

ECCENTRIC CHUCK.

A steel eccentric chuck for turning four different throw eccentrics by simply changing the position of the eccentric plate on the chuck plate is shown in Fig. 14. The pockets are counterbored in the chuck plate and located so as to give the desired throws, and each pocket is stamped the size of throw which it represents. The top side of the eccentric plate is made the size of the driving axle fit for the eccentric, while on the bottom side is a boss to fit the pocket in the chuck plate. When apply-

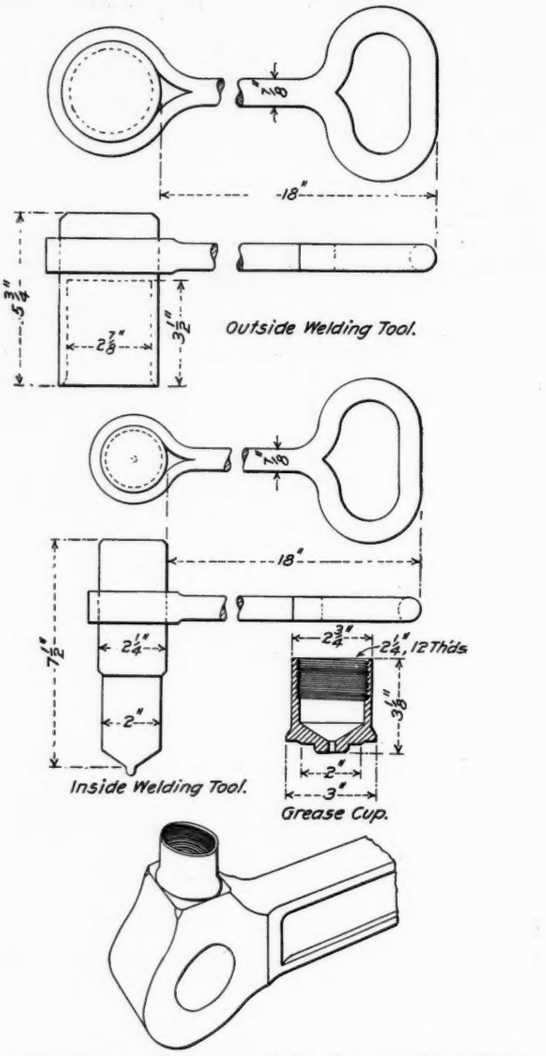


Fig. 13—Grease Cup and Tools for Welding It to Connecting Rods.

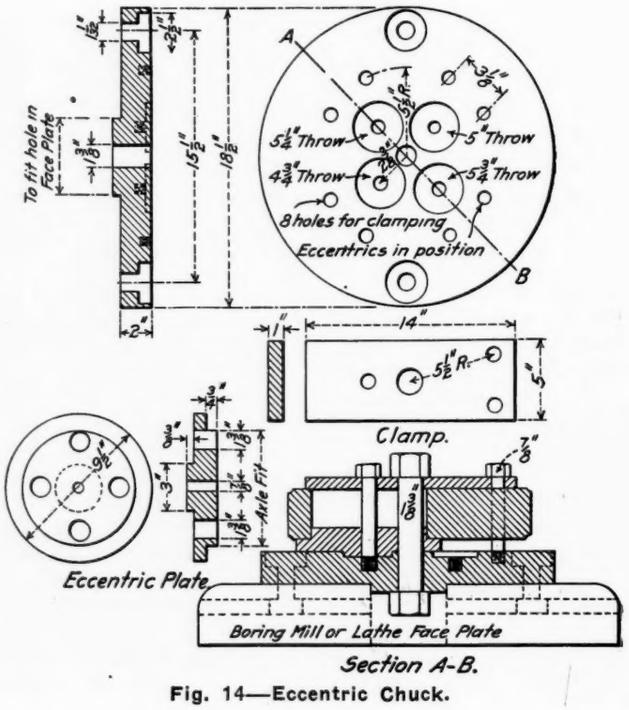


Fig. 14—Eccentric Chuck.

ing, the eccentric is placed in the pocket in the chuck plate and clamped, as shown in the sectional drawing. This chuck can be placed on either a boring mill or lathe and will stand a heavy cut or feed. Eccentrics can be applied or removed rapidly and with little labor. The chuck will not only increase the output of the machine on this class of work but will insure a correct throw to every eccentric turned.

PORTABLE HYDRAULIC PRESS.

A hydraulic press for applying and removing driving box brasses is shown in Fig. 15. This press is used in both the machine shop and the roundhouse with satisfactory results. The entire outfit is mounted on a four-wheel truck. The pump, operated by air pressure from a hose connection to the shop air line, consists of an 8-in. air pump with the air cylinder removed and a piece of pipe fitted with a piston substituted for it. This piston forces the water into the 14-in. cylinder to operate the pressure piston. Water is supplied to the pump and press from a tank located on the truck and is controlled by four check valves and two cut-out cocks. After the water is used it is returned to the tank. The side view shows a driving box brass being applied and the end view a rod brass. In applying driving box brasses, it is necessary to use the extension piece, which, however, is easily removed when handling rod brasses. The press is equipped with a gage showing the number of tons' pressure being exerted. On several occasions the pressure was run up to 40 tons without any leak or apparent damage to the press.

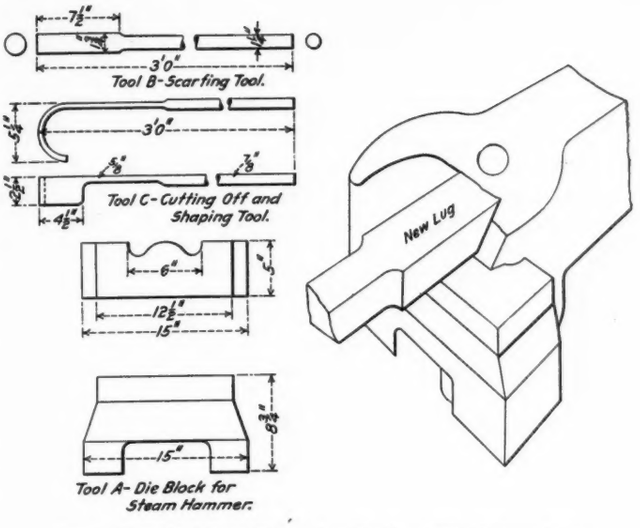


Fig. 17—Welding Tools for Broken Steel Couplers.

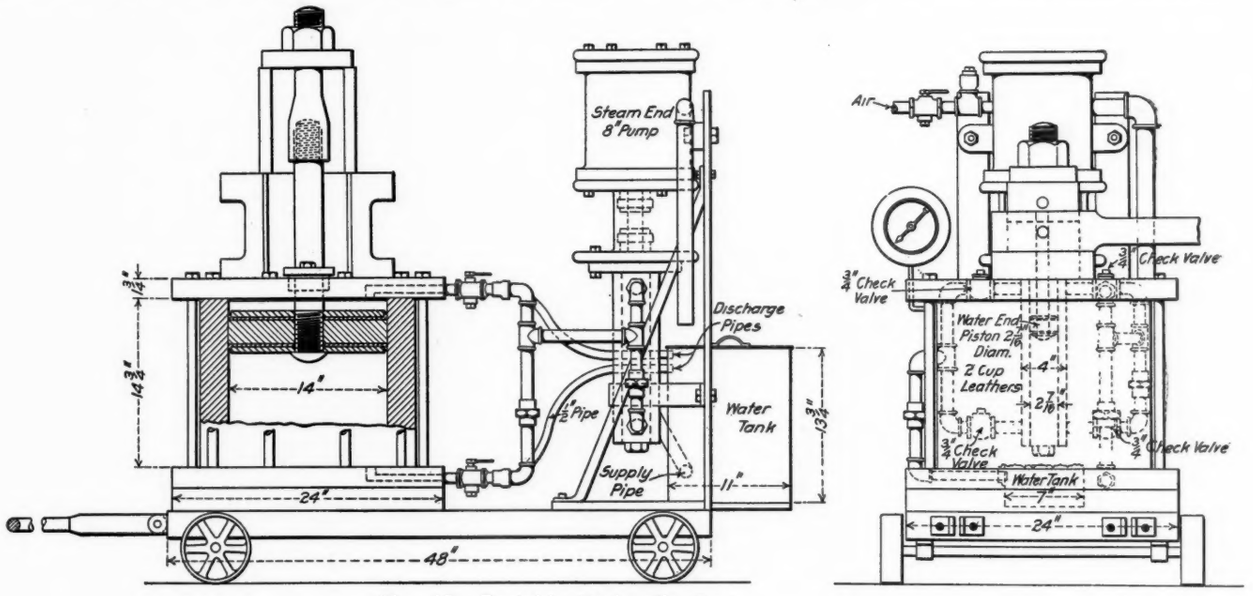


Fig. 15—Portable Hydraulic Press.

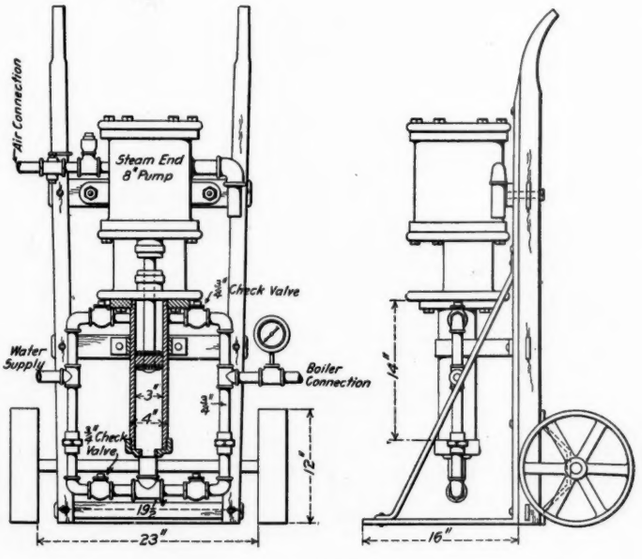


Fig. 16—Portable Hydraulic Testing Pump.

PORTABLE HYDRAULIC TESTING PUMP.

A portable hydraulic pump used in the erecting shop for testing boilers and in the roundhouse for testing steam pipes, valves, cylinder packing, etc., is shown in Fig. 16. The pump is mounted on a two-wheel truck and is made from an 8-in. air pump, the air cylinder of which is removed and a pipe substituted similar to that of the portable hydraulic press above described. Water is supplied to the pump from any convenient shop water line and the pump is operated by air pressure from the shop air line. Water pressure is controlled by four check valves and the amount of pressure is registered on a gage located in the water line to the boiler or steam chest. In testing steam pipes, valves, cylinder packing, etc., the pump is connected to the relief valve in the steam chest; it is connected, when testing boilers, to one of the washout plugs or blow-off cocks in the firebox. This pump has paid for itself many times in locating defects on engines giving unsatisfactory service.

WELDING BROKEN STEEL COUPLERS.

Tools for welding lugs on broken cast steel couplers are illustrated in Fig. 17. This work is done on a steam hammer

successfully and profitably, from $6 to $8 being saved on every coupler repaired in this manner. Tool A is the bottom die block for the steam hammer. This block is shaped to fit the inside of the coupler between the knuckle pin lugs; scarfing, welding and cutting off is done on this block. Tool B is used for scarfing, and tool C for cutting off and shaping the new lugs.

The perspective view shows a coupler and a new lug on the die block, scarfed and ready for welding. Sand or a welding compound should be used to insure a good weld. The work is simple and if properly handled no fitting is required to apply the knuckle, it being only necessary to drill the lug for the knuckle pin. Couplers have been repaired in this manner at the Columbus shops for the past two years and without a failure.

AIR-OPERATED PRESS.

The press shown in the drawing, Fig. 18, and in the photograph, Fig. 19, has been in use in the Columbus shops for several years. It is used continually by all departments of the shop in straightening damaged material and for forming new work. All steel car parts, with the exception of the center sills, are handled cold; the center sills, when badly damaged, are heated in a furnace near the press. The press is useful for straightening metal brake-beams, the dies used in this connection being made to do the work without removing the heads or fulcrums. Steel rails, up to 90-lb. sections, may be broken into guard rail lengths by a single blow, using the press as a hammer. The frame of the press is made of four 80-lb. rails, there being two rails to each half. These halves are bolted together with steel tie plates. The two parts of the frame are spaced 4 in. apart with blocks and are held together with through bolts. The face plate is made of cast iron, and is 96 in. long, 60 in. wide and 10 in. high. This plate rests on top of the lower section of the frame, to which it is securely bolted. The top corners of the frame are stayed to the face plate by 1¼-in. rods, supplied with turnbuckles. A guide, made of 80-lb. rails, is placed about midway up of the frame, and also acts as a brace. It guides the piston rod, steel pins being placed to hold it in any desired position.

The cylinder is made of steel tubing, 20 in. in diameter, and is carried on four rollers which run on the top rails of the frame. It is moved across the frame by a wire cable, operated by a hand wheel. The end of the piston rod is made for attaching different shaped dies or shoes. From 90 to 100 lbs. of air is sufficient for most all classes of work, but on several occasions it has been run up to 140 lbs. without damage to the press.

The press has made possible the repair of badly damaged steel-car material which would otherwise be scrapped, and has reduced the cost of repairs to these cars by 50 per cent. Bent couplers, body bolsters, truck bolsters and truck sides are easily straightened under the press and used again. Two men recently straightened 150 brake-beams in eight hours, the work including cutting off the damaged heads and fulcrums.

Credit is also due Chas. Cox, foreman blacksmith; J. M. Plant, foreman machine shop, and H. S. Remington, air brake inspector, for their assistance in devising and making these shop kinks a success.

TWENTY-NINTH COLLECTION.

BY WM. G. REYER,
General Foreman; Nashville, Chattanooga & St. Louis, Nashville, Tenn.

ROD BUSHING REAMER.

The drawing, Fig. 20, shows a reamer for truing solid rod bushings after they have been applied to the rod. It is a handy, adjustable cutter for use on a drill press; the various parts are of mild steel, except the $\frac{5}{16}$-in. cutters, which are of high-speed

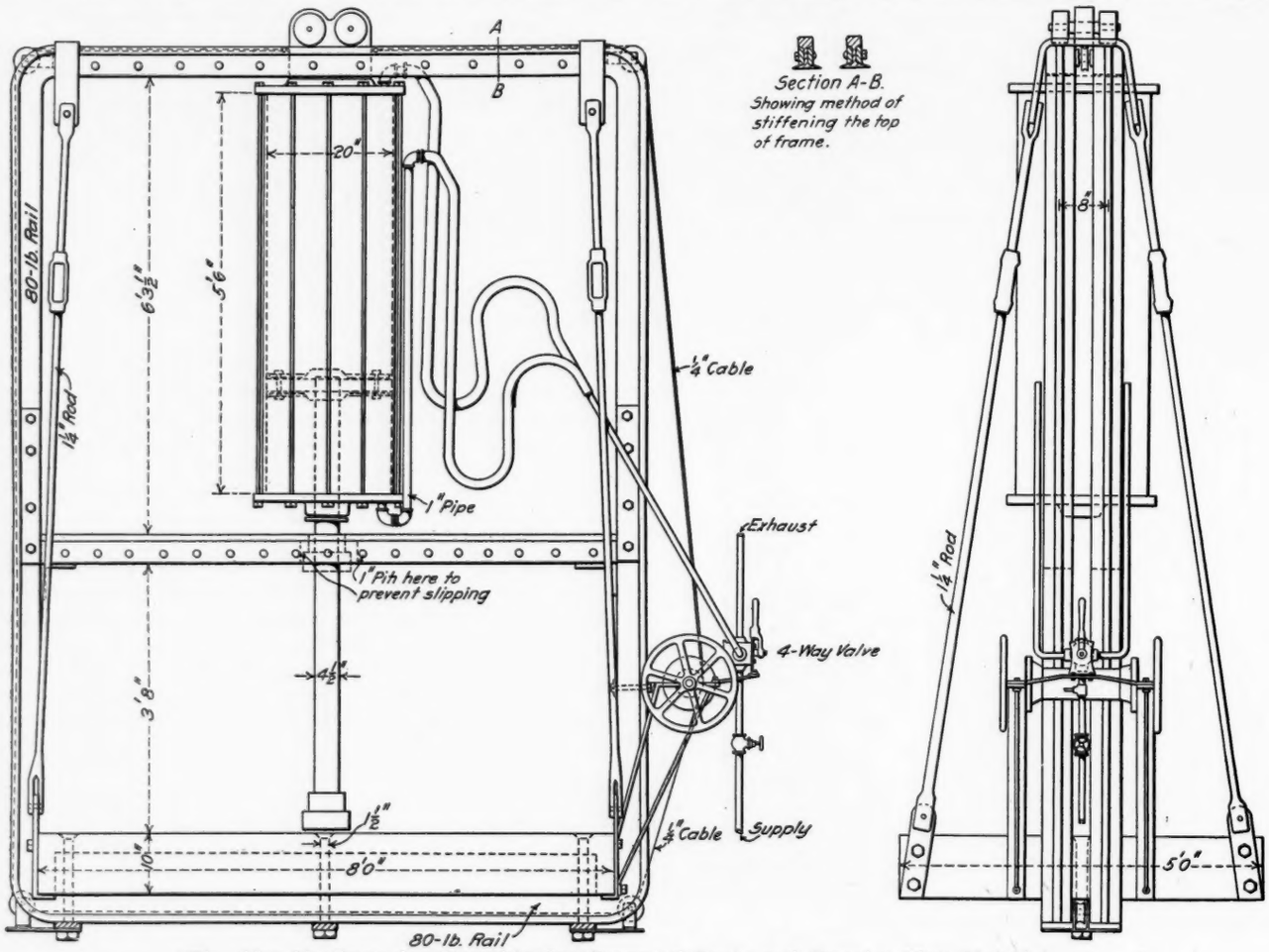


Fig. 18—Air Press for Straightening Damaged Parts and Forming New Material.

steel. Rod bushings are bored to pin size, applied to the rod and then placed on the drill press for truing with this tool. The plunger M is recessed to lighten it and is also slotted to carry the cross bar N, which, actuated by the knurled nut D, forces M backward or forward, depending on whether the cutters are to

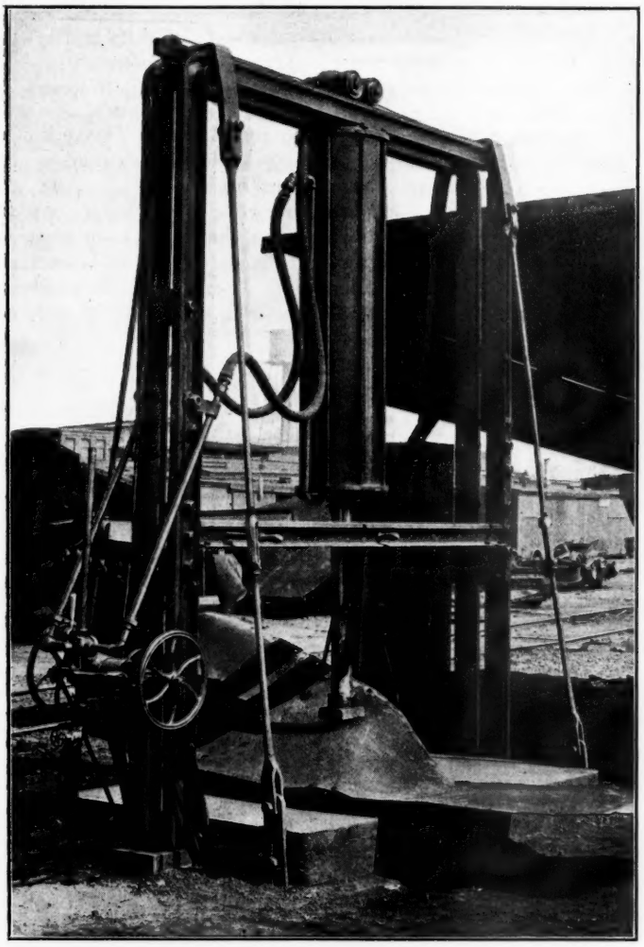


Fig. 19—Air Press Straightening a Damaged Steel Plate.

be expanded or contracted. With it and a drill press equipped with an air clamp, a rod may be reamed and handled, floor to floor, in five minutes.

GANG MILLING TOOL.

A gang tool for milling crosshead gibs, shoes and wedges is shown in Fig. 23. This tool is used on a horizontal milling machine, the chuck blocks shown in Fig. 21 being used for holding the work. In milling shoes and wedges with this tool, the outside of the shoe or wedge is machined with tools having 16 inserted cutters of high-speed steel, ¾ in. in section, the cutting points of which make a 16-in. diameter circle. The frame fit of the shoe or wedge is made with a tool 10½-in. in diameter, with 16-in. inserted cutters.

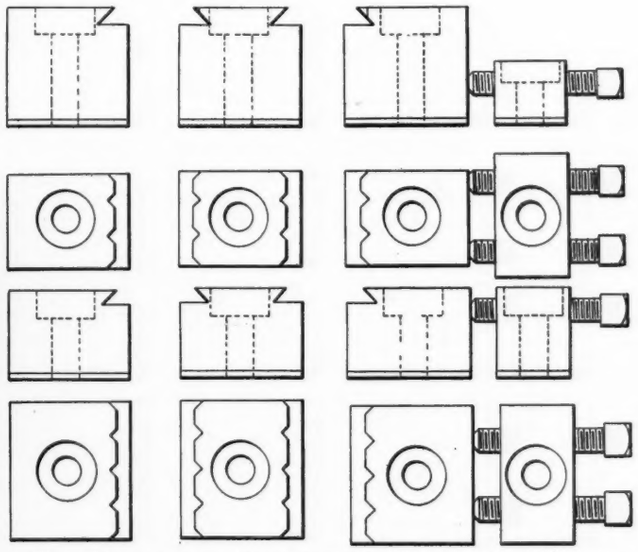


Fig. 21—Chuck Blocks for Shoes and Wedges and Crosshead Gibs.

An adjustable telescopic sleeve is used for gaging the thickness of the flanges. In finishing the edges of the flanges, mills of proper diameter are used by inserting them in the gang head. This edge milling on the flanges, however, is applicable only to shoes.

The body of the outside tools is made of two soft steel forgings; the main, or outside member, has a hub which is bored and key seated for the main spindle, and the inner face is turned at an angle of 45 deg., the angle of the tool. The two pieces are clamped together, using six or eight ⅝-in. bolts.

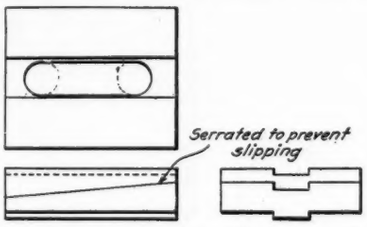


Fig. 22—Adjusting Wedge for Elevating Center Chuck Block in Milling Wedges.

Two of these tools are used at a time, the cutters being ground

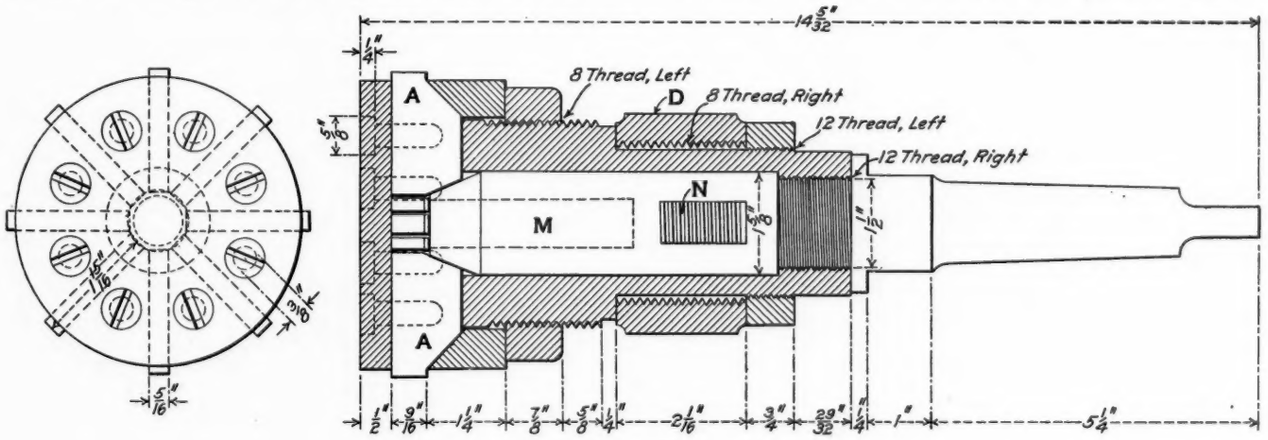


Fig. 20—Rod Bushing Reamer.

right hand on one and left hand on the other, so that they will cut in the same direction. The mill used for cutting out the frame fit has inserted cutters at proper angles to form a spiral. This member is made solid of soft steel, forged from an old locomotive axle and is bored and key-seated to suit the main spindle. The inserted cutters in this head or mill are 1½ in. wide x ⅜ in. thick, and of lengths to suit the frame fit required. An adjusting wedge for elevating the center chuck block in milling wedges is shown in Fig. 22.

With this gang miller it is possible to mill a shoe and finish, both inside and outside, in 15 min.

TEMPLATE FOR DRILLING HUB PLATES.

This is a simple device (Fig. 24) and can be made very cheaply of tool steel. The centers, or template screws, are

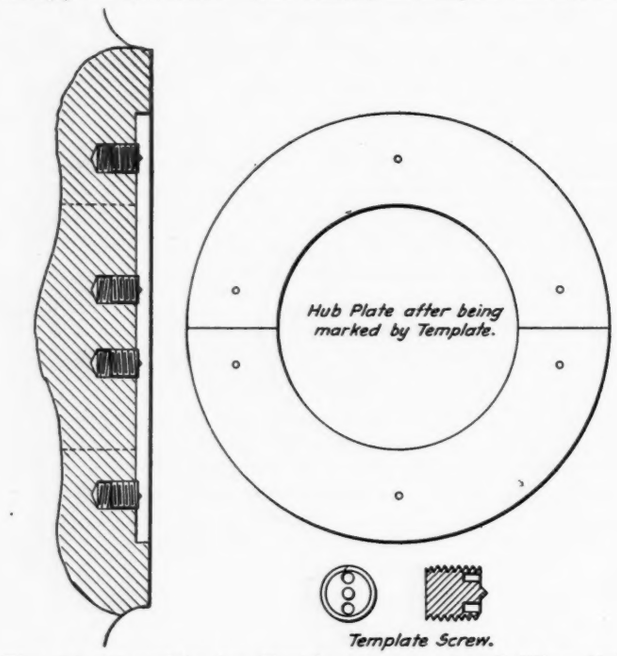


Fig. 24—Template for Marking Centers for Drilling Hub Plates.

screwed into tapped holes in the template. It is placed on the hub plate and tapped with a hammer, thus marking the centers for drilling.

FLUE CUTTER.

This tool, shown in Fig. 25, drills, reams and removes the burrs at one operation, making a perfect hole. It is possible to cut 247 2¼-in. holes in eight hours. The shank and body are made of soft steel and the center is of tool steel. The cutter, reamer and burr remover are made of high-speed steel. This tool, with reamer attached, makes tight and perfect application

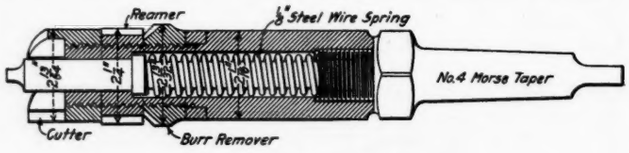


Fig. 25—Flue Cutter.

of the flues possible. It is used on a drill press. The spring in the tool holds the tit in the small hole, guiding the cutter.

FLANGING ATTACHMENT FOR SHEARS.

A useful device for flanging light work in the boiler shop, as shown in Fig. 26, is applicable to any heavy shear in place of the regular blades. This tool has flanged 444 ft. of ¼-in. tank steel in two hours and five minutes. It may be made to flange at any angle, working metal up to ⅞-in. thick. It is made of

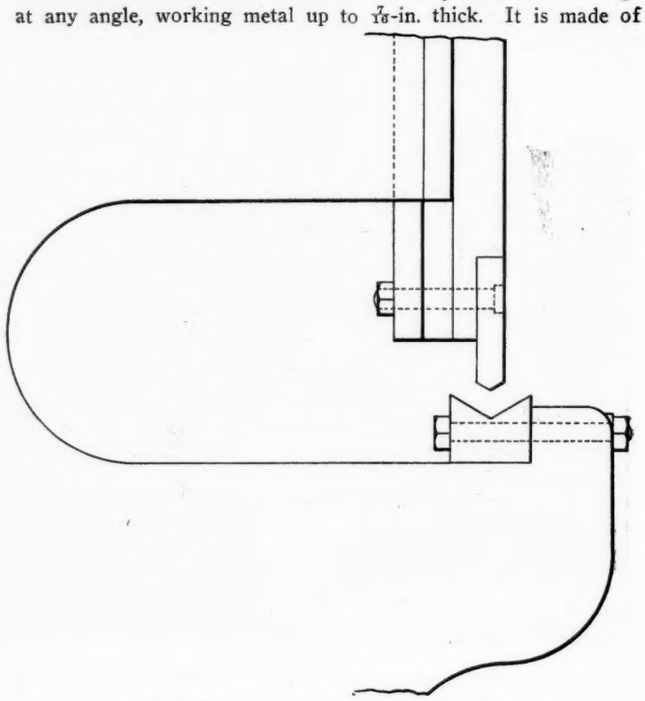


Fig. 26—Flanging Attachment for Shears.

hardened tool steel and may be adjusted to suit any angle or thickness of plate by slipping liners under the lower former. This tool was used on 146 drop-bottom ash pans, requiring flanges top and bottom the full length of the pan. This work

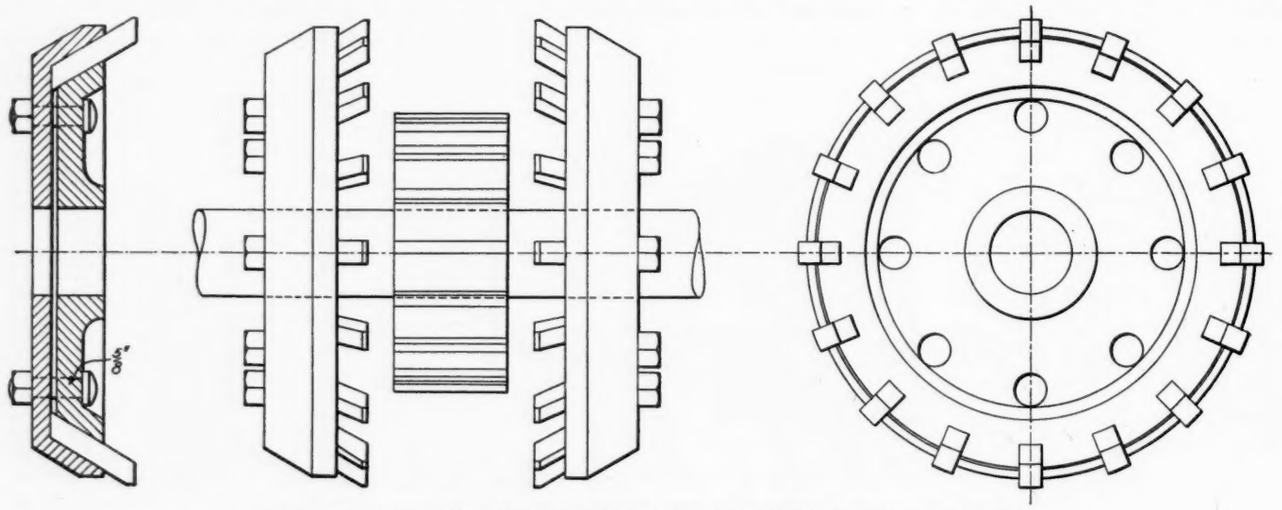


Fig. 23—Gang Milling Cutter for Shoes and Wedges and Crosshead Gibs.

was done with the saving of $4.85 on each pan. It has also been used in flanging several straight crown sheets and a large amount of car work. The work is all handled cold.

SLOTTER OR LATHE BRAKE.

This device, shown in Fig. 27, enables the operator to stop a machine at any point, thereby saving the time and labor necessary to pull the belt. A substantial brake of this kind is important on a slotting machine. The brake, which is applied to the large step of the cone, consists of an expansion ring of 3-in. x $\frac{3}{16}$-in. steel, formed to a circle ½ in. less in diam. than the inside of the cone. On the outside of this ring a band of wood fiber is riveted, which latter makes the friction contact. A compression spring and a dog are arranged to apply and release the brake. The block, which is riveted to one end of the band, is slotted to admit a cam or eccentric-shaped dog, keyed or pinned

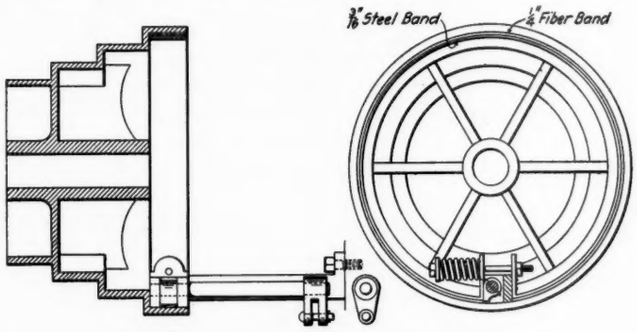


Fig. 27—Brake for Slotter or Lathe.

to the shaft. Through a series of bell cranks and rod connections the hand lever for operating this brake can be placed in any convenient position. The same idea is applicable to wheel lathes by reversing the action or contracting the band instead of expanding it, as the brake must be applied externally to the largest step of the cone.

OLD MAN FOR BOILER SHOP.

A useful tool for staybolt drilling is shown in Fig. 28. It may be very successfully used in wide fireboxes. Two motors may be used at the same time, as two arms are provided. It is easily possible to drill over a wide range without changing.

The shaft, made to suit any size firebox, is of 1¼-in.

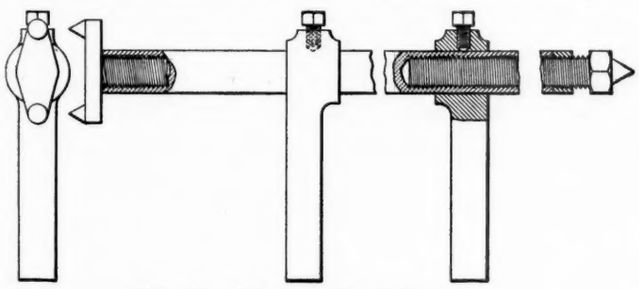


Fig. 28—Old Man for Boiler Shop.

double strength pipe. The double point end is welded in the pipe. The other end screws into the pipe and when adjusted may be securely clamped by the use of a jam nut. Wrought iron arms are slipped on the shaft and secured by set screws.

In the case of a locomotive which went into the roundhouse with 27 broken staybolts in the firebox, this old man was used and the bolts drilled out in an hour and 50 minutes.

THIRTIETH COLLECTION.

BY JOHN V. LE COMPTE,
Assistant Foreman; Baltimore & Ohio; Baltimore, Md.

ECCENTRIC MANDREL FOR BORING MILL.

A rigid mandrel with an adjustable throw, for use in turning eccentrics on a horizontal boring mill, is shown in Fig. 29. The shaft of the mandrel being solid, is adapted only for eccentrics of a given bore. The eccentric is placed on the shaft of the mandrel and is held from turning by the feather in the shaft. The lug on the bottom of the mandrel slides in a slot in the base, thus providing for the adjustment of the eccentricity by means of the adjusting screw. The base may be graduated to facilitate adjustment to any desired throw. The table of the boring mill is grooved to accommodate the annular boss on the base of the mandrel, which is clamped to the bed through the four lugs shown. After two or three eccentrics are applied to the mandrel, depending upon their thickness

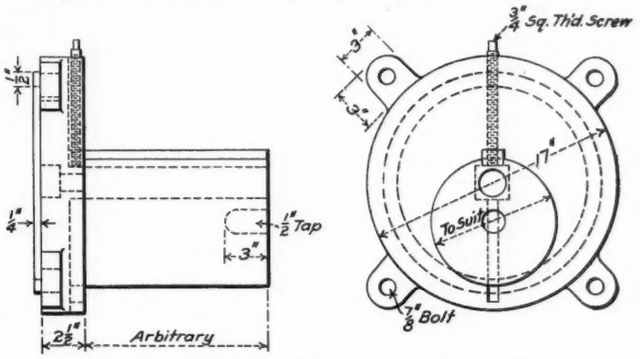


Fig. 29—Eccentric Mandrel for Boring Mill.

and the height of the mandrel, which latter may be made to suit any conditions, a heavy washer is placed over the top eccentric and clamped to the mandrel by a 1¼-in. bolt. The following results have been obtained with this mandrel on a 42-in. Gisholt boring mill, using both heads. In a day of 10 hours, 18 eccentrics, 17 in. in diameter, 4½-in. face, with 2½-in. boss, making the width 7 in., were finished. Two eccentrics were applied at a time, making nine separate operations. This method increased the output for this size eccentric by 45 per cent. On another day of 10 hours, 22 eccentrics, 14⅝ in. in diameter, 4-in. face, and without a boss, were turned. Three eccentrics were applied at a time. This method increased the output for this size eccentric by 54 per cent.

DRIVING BOX BORING BAR.

A double tool boring bar for finishing driving box bearings is illustrated in Fig. 30. The lower end of the bar fits in a bushing in the table of the boring mill. The head carries two tools, one for roughing and the other for finishing, both of which are made of 1-in. square steel. The finishing tool is first applied and about ¼-in. depth of metal removed in order to get the proper size. The roughing tool is then adjusted to

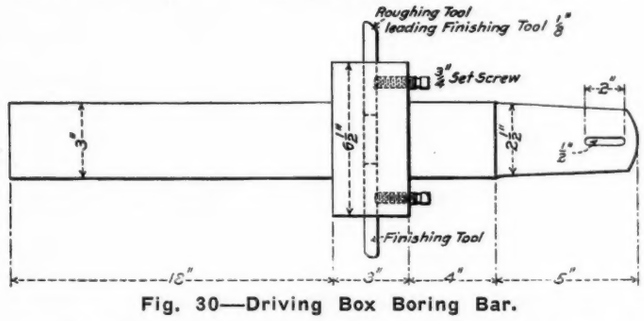


Fig. 30—Driving Box Boring Bar.

leave $\frac{1}{32}$-in. to be removed by the finishing tool and set to lead the finishing tool by ⅛-in. This operation therefore roughs and finishes the bearing simultaneously. After the box is finished the tool is moved back to the top and the box revolved once to make sure it has not been moved while the cut was being taken.

Before the box is removed it is moved from ¼ in. to ⅜ in. away from the center and a cut run through to remove the metal below the horizontal diameter line and at the retaining shoulder, thus eliminating the necessity of any chipping in the erecting shop in order to get the box to fit down over the journal. The entire operation saves about 50 per cent. of the time

formerly required for doing this work. This tool is used on a Niles-Bement-Pond boring mill.

OIL CELLAR BORING CHUCK.

A four-tool chuck for boring oil cellars and grease lubricators is shown in Fig. 31. This chuck was devised to do the work formerly handled by a single tool boring bar used on a

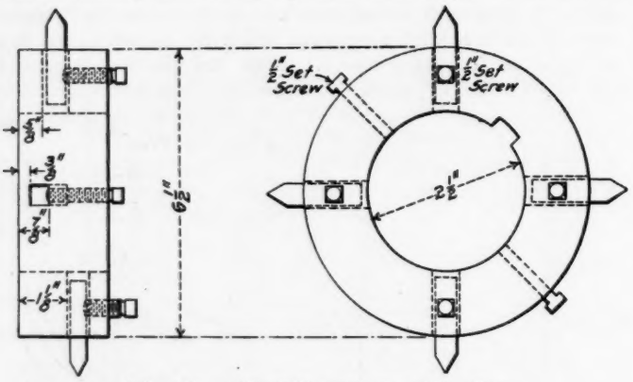


Fig. 31—Oil Cellar Boring Chuck.

horizontal mill. The chuck carries four independent tools made of 1-in. square steel, which are held rigidly in place by set screws and are easily adjusted. The practice is to have the cellar fit within 1/16 to 1/8 in. of the journal to prevent unnecessary waste of grease and oil. As the journals are allowed ½ in. limit of wear it may require a cut of 1/8 in. or more to bore the cellar to fit a new axle. The four cutters are adjusted at different lengths in order that each may do its proportionate share of the cutting. This chuck is of simple design, yet it has increased the output to 25 cellars per day and decreased the cost of this work about 20 per cent.

THIRTY-FIRST COLLECTION.

BY K. J. LAMCOOL,
Special Apprentice; Chicago, Indianapolis & Louisville; Lafayette, Ind.
Credit also due J. S. Naery, Jr., Special Apprentice.

CAR WHEEL AND AXLE HOIST.

An overhead traveling hoist used for loading and unloading wheels and axles is shown in Fig. 32. It consists of two tripods, the legs of which are made of 3-in. gas pipe, and are fitted to cast iron shoes at the bottom. These shoes rest on blocks of stone 20 in. square, which are let into the ground and set in concrete. The bolts which hold the shoes are let into the stone and leaded. The castings at the top are made to hold the three legs and the ends of the two I-beams, which are 5-in. high and 30 ft. long. These I-beams are trussed on the under side with 7/8-in. rods. The trolley has four wheels, 12 in. in diam., and axles 1½ in. in diam. A Y-shape hanger is suspended from the axles and between the I-beams; it is made of 1¼-in. x

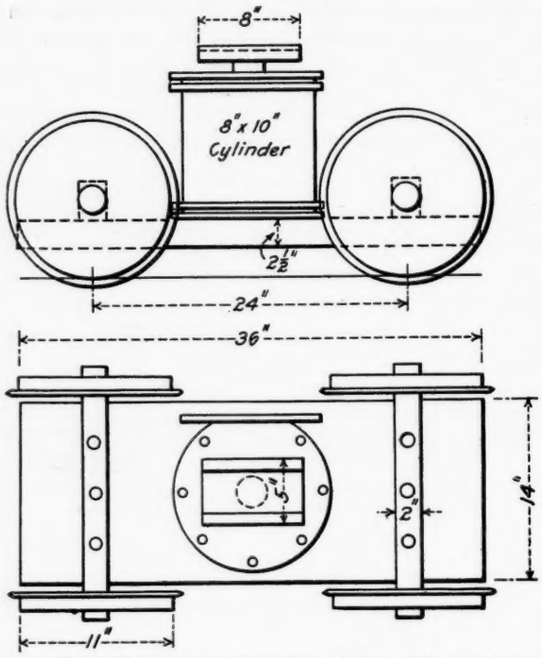


Fig. 33—Lifting Jack for Use at Car Wheel Lathe.

4½-in. iron. The air cylinder is 10 in. in diameter and has a 5 ft. stroke. The wheels are stored on a number of parallel tracks, which run at right angles to the yard track over which the wheels are brought to storage. A 20-in. gage track runs from the machine shop, through the center of the storage yard and parallel to the yard track. This divides the storage space into two parts, one of which is used for receiving and the other

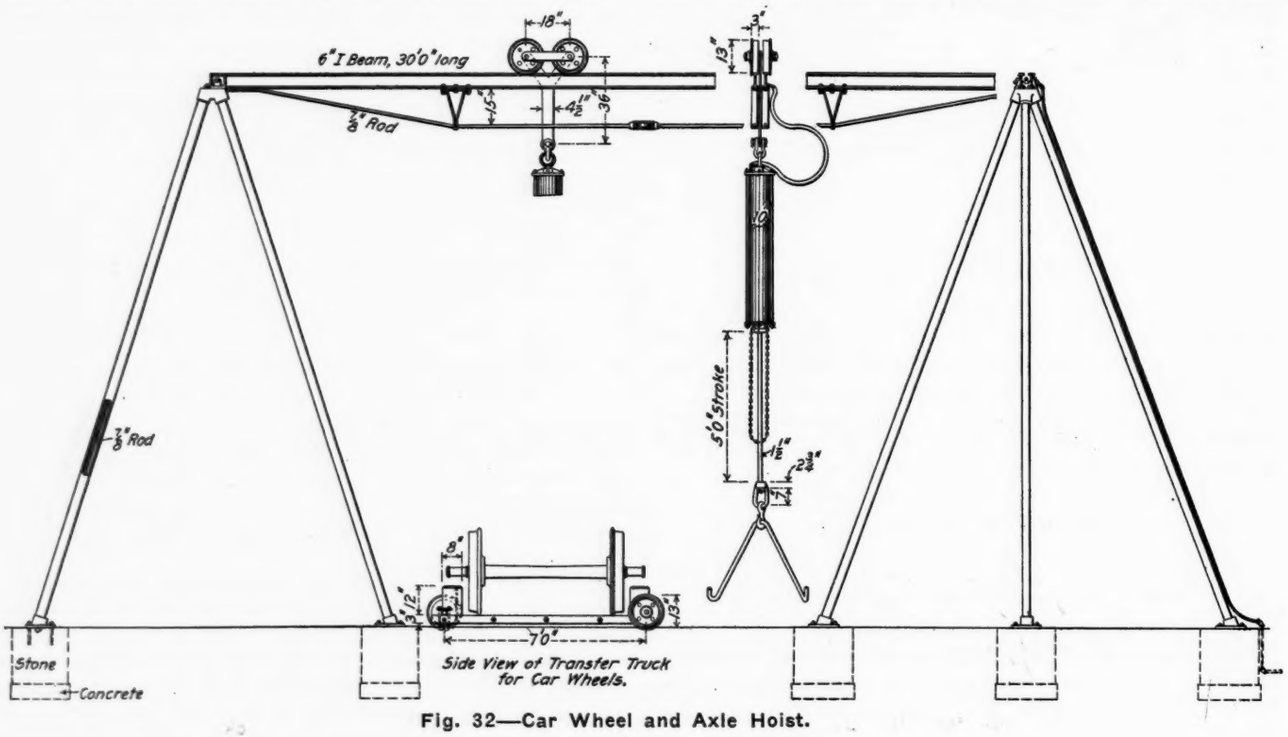


Fig. 32—Car Wheel and Axle Hoist.

for shipping wheels. The wheels are taken from the receiving side of the storage yard to the machine shop and returned to the shipping side of the storage tracks on the small truck shown. With this hoist two men can load or unload a car of from 14 to 18 pairs of wheels in from 15 to 20 min.

WHEEL AND AXLE JACK.

The lifting jack, Fig. 33, is for use at a wheel lathe. The 8-in. x 10-in. cast iron cylinder is bolted to a heavy wooden plank. A piece of boiler steel, formed to fit the axle, is carried by the piston rod. Wheels are run in on the 20 in. gage track from the storage yard, mentioned above, and are run over the hoist which elevates them to proper position in the lathe.

OIL BURNER.

Two oil tanks, 12 in. x 33 in., set on two-wheeled trucks, are used in welding frames in position. Four to five gals. of oil

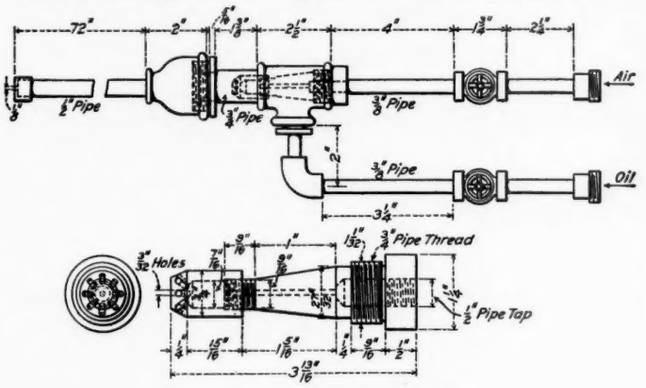


Fig. 34—Oil Burner.

per tank at 180 lbs. air pressure are required to make the average weld. A frame 5 in. x 5 in. and one 2½ in. x 12 in. have been successfully welded in these shops by this method. The drawing, Fig. 34, shows the general design of the burner used.

BORING BAR.

The boring bar shown in Fig. 35 may be used for either cylinders or piston valve chambers. It is operated by an air motor, the spindle being geared to the main shaft of the motor. The feed is operated through the 1⅛-in. diam. lead screw, actuated by the star wheel. The bar is held in position by the two heads which have shoulders to fit the bore of the piston valve chamber or cylinder. These heads are clamped to the cylinder.

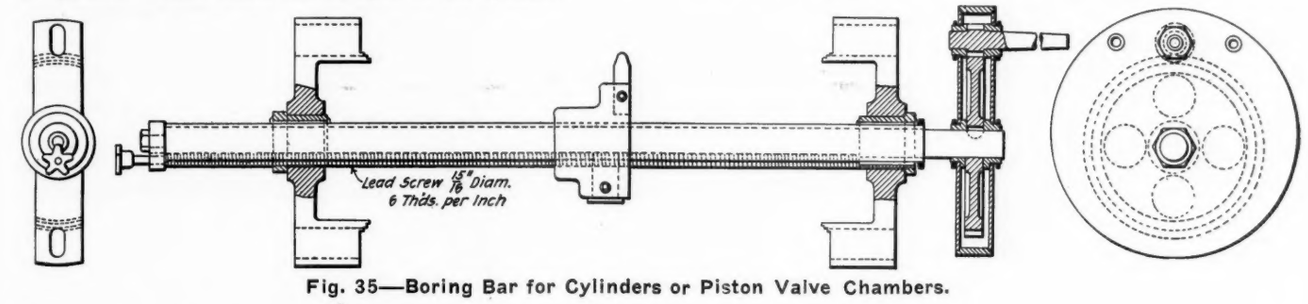


Fig. 35—Boring Bar for Cylinders or Piston Valve Chambers.

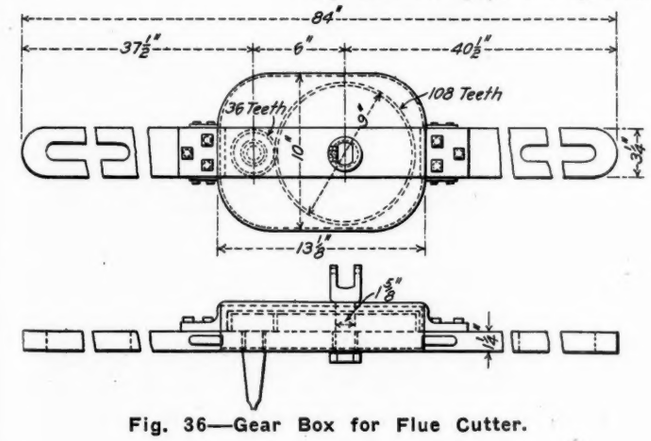


Fig. 36—Gear Box for Flue Cutter.

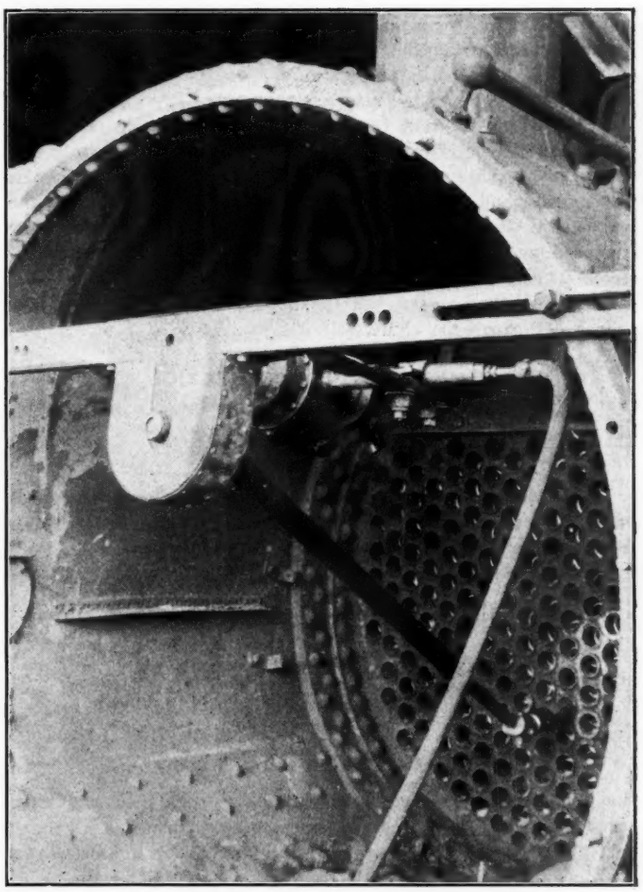


Fig. 37—Apparatus Adjusted for Cutting Flues.

FLUE CUTTING.

The apparatus for driving a flue cutter and the way in which it is applied are shown in Figs. 36 and 37. The gears for reducing the motor speed are in a sheet iron case which is attached to the slotted bar. The bar which transmits the motion

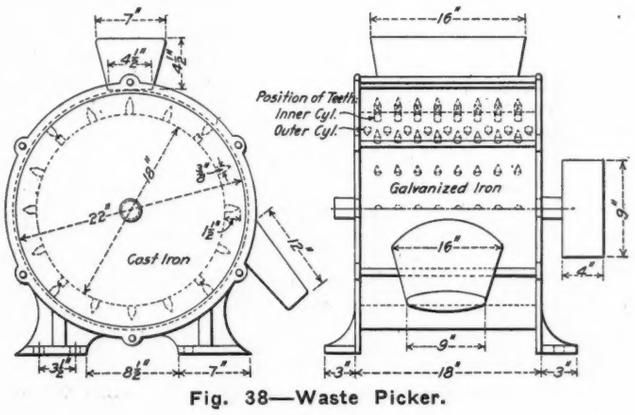


Fig. 38—Waste Picker.

to the flue cutter is in three parts, connected by knuckle joints, thus making it flexible and allowing the cutter to be changed from one flue to another without adjusting the gear box. The machine is operated by an apprentice.

WASTE PICKER.

A waste picker used for repicking the old waste shipped to the main shop from various points on the road is shown in Fig. 38. This device not only loosens up the waste but also removes the cinders and gravel. The cast iron cylinder, 18 in. in diam., carries on its outside 16 rows of ⅜ in. teeth. The cylinder is inclosed in a galvanized iron casing, which has four rows of teeth which fall between those on the cylinder. Old waste is fed into the picker through the hopper at the top and is discharged through the chute.

THIRTY-SECOND COLLECTION.

BY A. S. WILLARD,
Foreman, Norfolk & Western, Crewe, Va.

LINK BUSHING MANDREL.

A mandrel for turning bushings of various kinds and sizes, especially for motion work, is illustrated in Fig. 39. The nut and sliding portion are removed, the mandrel inserted in the

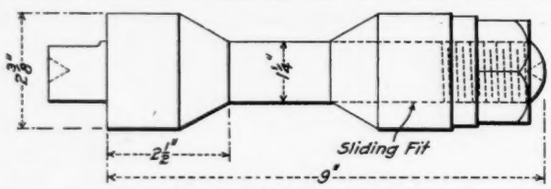


Fig. 39—Link Bushing Mandrel.

bushing, and the sliding portion and nut re-applied and tightened sufficiently to prevent the bushing from turning. The mandrel is made of tool steel and the conical portions are case hardened. The time and labor required for doing this work have been reduced about 50 per cent. by the use of this style of mandrel.

HEAVY DUTY BORING AND TURNING TOOL.

A heavy duty boring and turning tool for use on engine lathes is shown in Fig. 40. It is used in place of the tool post and is clamped to the slide rest by two ¾-in. bolts as shown in the drawing. After the holder is placed in position it is un-

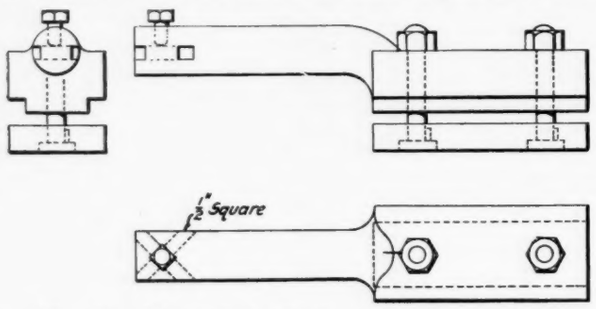


Fig. 40—Heavy Duty Boring and Turning Tool.

necessary to remove it for grinding the cutter, which may be easily removed and replaced by slackening off and tightening the set screw. The cutting tool is made of ½-in. square tool steel and may be set to bore on either side. The time consumed in turning rod bushings, for which it is used almost entirely, has been reduced about 35 per cent.

PNEUMATIC HAMMER.

The pneumatic hammer, Fig. 41, is especially useful for removing main rod and frame bolts. Air is admitted through the valve A, under the telescopic piston, forcing the head against the bolt. By alternately opening and closing the valve B, air is admitted and exhausted from the cylinder C, projecting the hammer against the anvil, which is in contact with the bolt. This hammer will strike a blow varying from 800 to 1,000 lbs. A great saving is made in both time and material, as a bolt is very seldom damaged when removed in this way.

STUD WRENCH.

A steel tool used for applying and removing stud bolts is shown in Fig. 42. A 1½-in. hole is drilled in the center of the hinged portion, and teeth are filed along half of the circle opposite the hinge pin. The swinging portion is slotted to re-

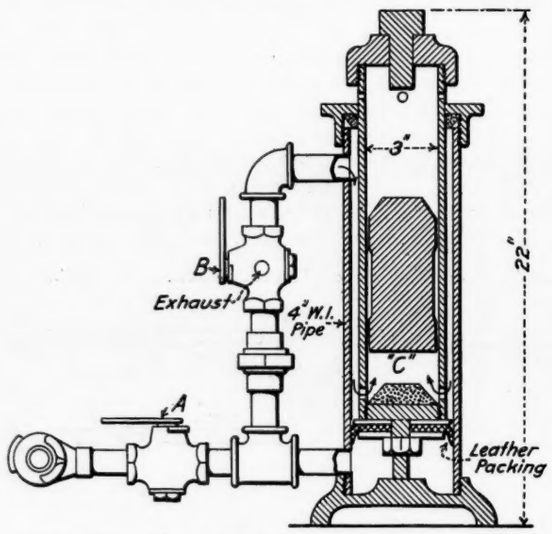


Fig. 41—Pneumatic Hammer for Removing Frame Bolts.

ceive the lever, which also has teeth filed on a circular end. The swinging part and the end of the lever which engages the stud are case hardened. The ease with which this tool can

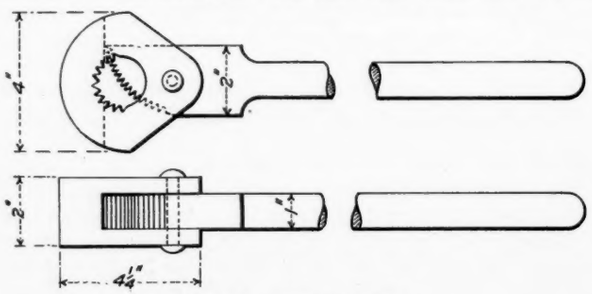


Fig. 42—Stud Wrench.

be adjusted, its simple construction and great strength as compared to the ordinary alligator or Stilson, make it an efficient and useful tool.

STACK CRANE.

The light stack crane, Fig. 43, is made of wrought iron, the trolley rail being ¾-in. x 2½-in. bar iron, to which is welded a rod 1 in. in diameter that extends back to and down the top of the stack. The trolley rail has a forked end to fit the

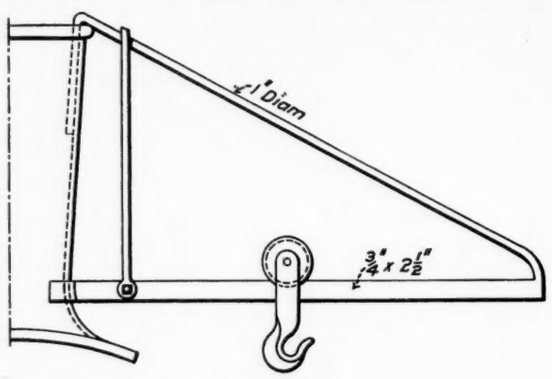


Fig. 43—Stack Crane.

base of the stack and carries a trolley wheel with a suitable hook for attaching a block and fall. This device is used for lifting steam chests, pistons, cylinder heads, etc. It is handled by one man, who can do the work formerly done by three men.

THIRTY-THIRD COLLECTION.

BY C. J. DRURY,
General Roundhouse Foreman; Atchison, Topeka & Santa Fe; Albuquerque, New Mex.

BLADE BENDER.

A simple blade bender, Fig. 44, can be made at a cost of $2.25. Instead of employing the old method of twisting and bending with heavy apparatus and using heavy wrenches, this simple kink can be operated with a 12-in. wrench. Special attention is called

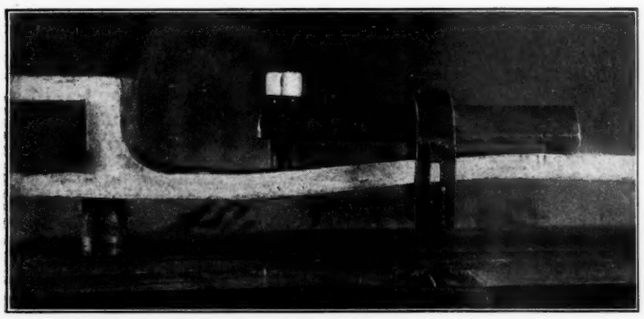


Fig 44—Blade Bender.

to the short bends possible and the close places in which the bender can be operated. The slip yoke is moved along the blade so that an adjustment can be quickly made for a bend at any point. It is a cheap and handy kink for use on eccentric blades, reach rods, lifting arms, etc.

DEVICE FOR RESEATING CHECK VALVES.

This kink, Fig. 45, can be made at an expense of about $1.50.

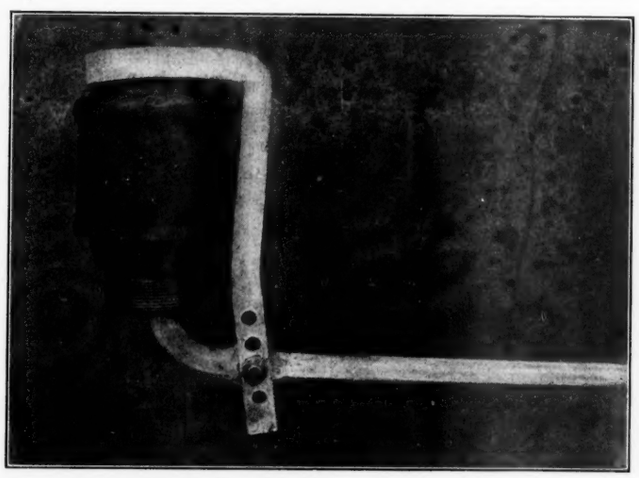


Fig. 45—Device for Reseating Check Valves.

The sticking of boiler checks is one of the chief troubles in a roundhouse, and is especially annoying and expensive if it happens when a locomotive is ready to go out. The simplicity of this device is at once noticeable, both as to its design and its use. The branch pipe is disconnected, the device placed as shown and the handle operated until the scale or other foreign matter, which holds the check valve from its seat, is released and blown out. It often saves the expense of knocking fires and blowing off boilers to repair the check.

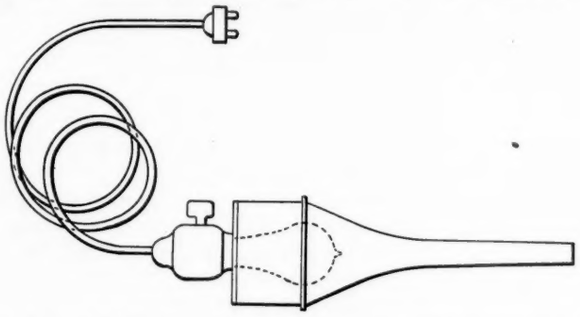


Fig. 46—Device to Facilitate Taking Piston Valve Port Openings.

DEVICE TO FACILITATE TAKING PISTON VALVE PORT OPENINGS.

Most machinists know what trouble is experienced in taking the port openings on a piston valve locomotive when steam is up. The device shown in Fig. 46, which can be made for 75 cents, greatly assists in this work. An indicator plug is removed and the small end of the device inserted. It is provided with an electric light and the opening can be plainly seen, regardless of the steam. No guesswork is necessary, as is the case when using pieces of tin or wire to catch the openings.

THIRTY-FOURTH COLLECTION.

BY GUY A. ADAMS.
Foreman, Freight Car Shop; Boston & Maine; Concord, N. H.

CLOSE-QUARTER DRILLING ANGLE.

The device shown in Fig. 47 is used for doing close-quarter drilling in connection with the work of splicing sills. That portion of the sill which remains on the car cannot be reached without some device of this kind. The bevel gears are 1 in. in diameter and enclosed in a light casing. In using, the casing is held in the right hand and the Little Giant motor in the left hand. A short shank is welded on the bit, and is held in the socket of one shaft, while the other is tapered to fit the socket of the motor.

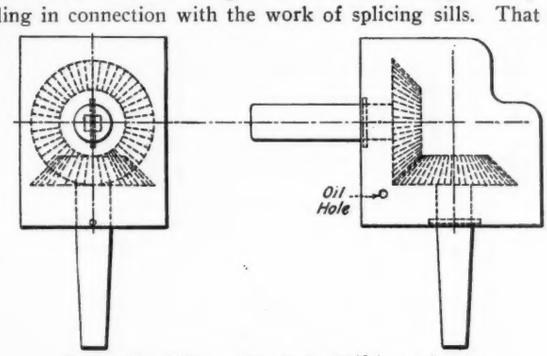


Fig. 47—Close Quarter Drilling Angle.

CYLINDER AND RESERVOIR WINDLASS.

A handy device for elevating and holding the air cylinders and reservoirs of freight cars in place for bolting is shown in Fig. 48. The frame consists of two oak pieces, 1⅛ in. x 6 in. x 4 ft. 6 in. They are spaced about 48 in. apart by pieces of 1-in. pipe and are held rigidly together by ½-in. iron rods, which pass through the pipes. The tops of the uprights are rounded off and notched to grip the corner of the side sill. Metal points in the feet of the uprights prevent slipping. The drum of the windlass

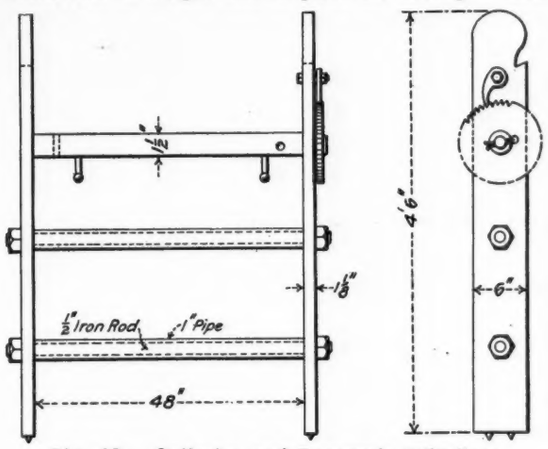


Fig. 48.—Cylinder and Reservoir Windlass.

consists of a 1½-in. pipe, at the end of which is a ratchet and pawl. When using, the device is set up at the side of the car, the notches gripping the corners of the side sills. Two pieces of 1-in. rope, about 18 ft. long, are spliced to the two eye bolts on the 1½-in. pipe. The loose ends of these ropes are fitted with hooks. These ends are passed over the truss rod to the ground. The cylinder, or reservoir, is then placed on the ropes, the ends of which are passed up and hooked over a piece of pipe placed parallel to the side sill to which the cylinder, or reservoir, is to be bolted. This pipe extends from one cross beam to another.

The slack in the rope is taken up and the cylinder lifted to position by using a bar in the holes in the drum. With this device it is easily possible for two men to do the work, which formerly required three.

CENTER AND SIDE-BEARING DEPTH GAGE.

A depth gage for adjusting center and side bearings on trucks is shown in Fig. 49. It consists of a piece of ⅞-in. material, 6 ft. long x 6 in. wide. The ends are shaped as shown in the drawing. An adjustable scale is located at the center of the gage. In using this device the ends rest upon the side bearings. The scale is then moved into contact with the center plate, indicating the thickness of the liner required.

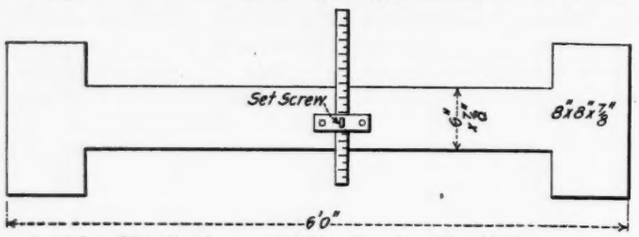


Fig. 49—Center and Side Bearing Depth Gage.

WINDLASS FOR RESERVOIRS ON NEW CARS.

The drawing, Fig. 50, shows a simple device which is a time-saver in putting up air cylinders and reservoirs on new freight equipment. The drum consists of a piece of 1½-in. pipe, 10 ft. long, the end of which is provided with an oak crossbar about 4 ft. long. This device is applicable only on new cars and is used before the flooring is laid. It is placed across the sills, and a piece of rope or chain is passed around the reservoir or cylinder, lying on the ground, and fastened to the windlass drum at the eye-bolts shown. By revolving the handle, the cylinder. or reservoir is elevated to position. Using this device, two men can place the cylinders and reservoirs on six cars in 30 minutes.

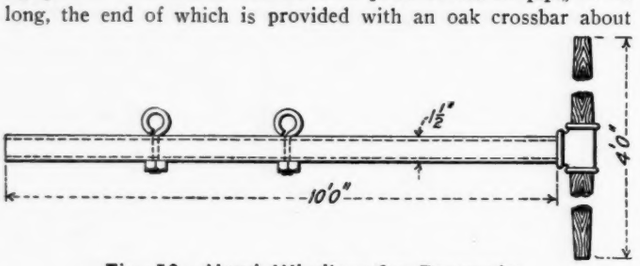


Fig. 50—Hand Windlass for Reservoirs.

HANDLE GOUGE.

A handle gouge used for cutting channelways for truss rods, on the under side of flooring and across body bolsters or transoms of freight cars is shown in Fig. 51. It is made from an ordinary Dabber's adz, the blade of which is dressed into the semicircle, as shown, with about ¾ in. radius. This tool is very popular, doing the work which formerly was performed with a mallet and hand gouge.

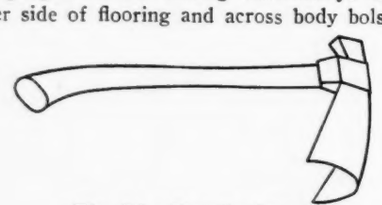


Fig. 51—Handle Gouge.

THIRTY-FIFTH COLLECTION.

BY JAMES STEVENSON,
Foreman; Pennsylvania Railroad; Olean, N. Y.

PISTON EXTRACTOR.

A piston extractor of unusual strength and one which will draw pistons without damaging the crosshead is illustrated in Fig. 52. The piston is first drawn back to its striking point. The long two-piece sleeve is applied to the rod, bearing against the packing gland. The two collars are then applied at the crosshead end of the rod. The halves of the collars are held together by bolts. Taper keys are driven in the ways between the collars to draw the piston.

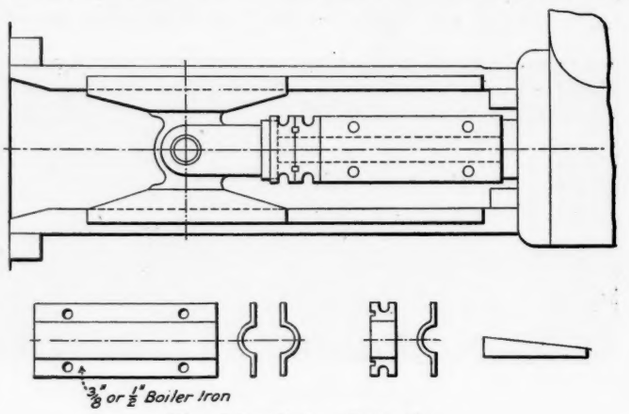


Fig. 52—Piston Extractor.

CYLINDER HEAD TRUCK.

A handy truck for handling front cylinder heads and placing them in position on the cylinders is shown in Fig. 53. The cylinder head is placed on the truck with the stud for the cylinder head casing projecting through the slot in the ⅜-in. plate. A washer and nut are placed on the stud to hold the head on the truck. The head is then adjusted so that when raised the studs will enter it correctly. The truck is lifted to the position shown in the drawing. The head may then be raised to the proper height by using a bar in the slot and held there by placing one of the U pieces in the holes underneath it. By moving the truck forward the head can then be slipped over the studs.

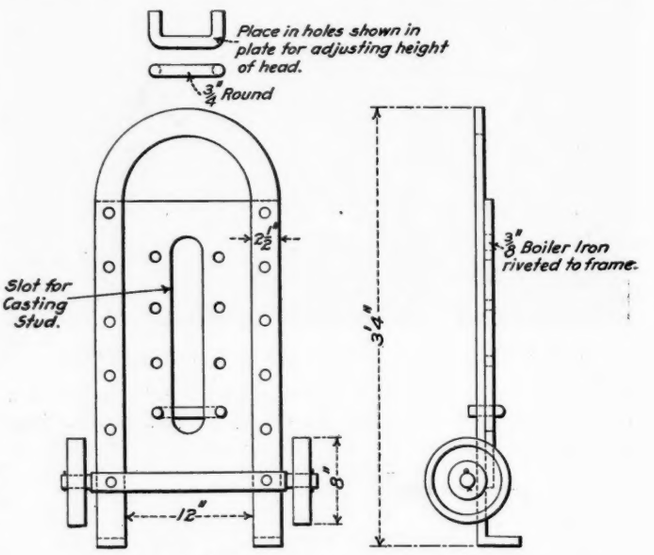


Fig. 53—Cylinder Head Truck.

CLEANING SHOP WINDOWS.

A method of cleaning shop windows with the aid of an air motor is shown in Fig. 54. A stiff brush is held in the socket

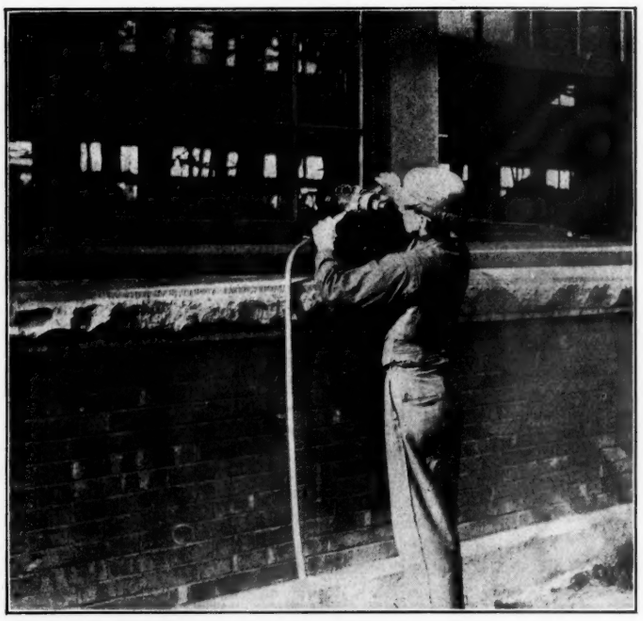


Fig. 54—Cleaning Shop Windows.

of the motor and, after dipping in benzine, is run over the window glass. A soft, dry brush is used for polishing after the glass has dried.

THIRTY-SIXTH COLLECTION.

BY S. S. LIGHTFOOT,
Bonus Demonstrator; Atchison, Topeka & Santa Fe; San Bernardino, Cal.

STAYBOLT CHUCK.

A chuck for applying and removing staybolts with an air motor or wrench is shown in Fig. 55. The chuck is made of machine steel, with hardened tool-steel jaw, or grip, and is designed to handle staybolts up to 1¼ in. in diameter. The jaw is set tangent to the center hole, as indicated by the sketch and is provided with both right and left-hand teeth for gripping the bolt in either direction. The jaw is made tapering, with the thick end at the bottom, to take different size bolts. The thickness

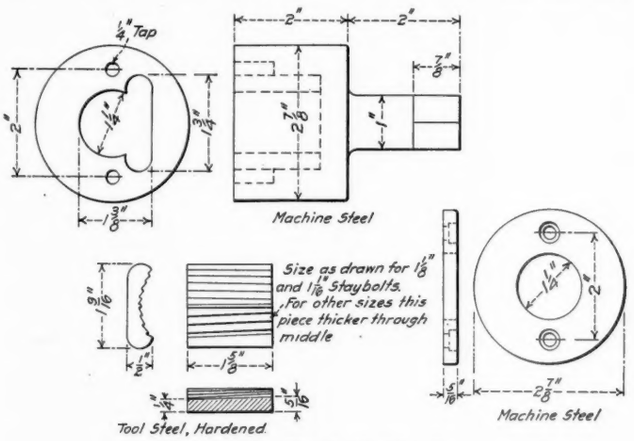
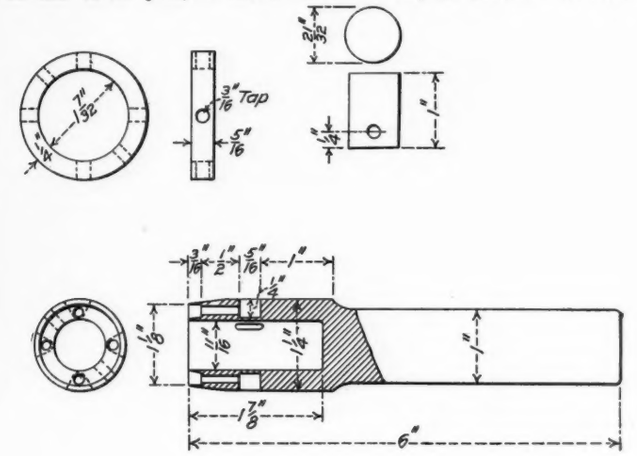


Fig. 55—Staybolt Chuck.

through the center section is varied, according to the diameter of the bolt. A ⅛-in. washer attached by two ¼-in. setscrews holds the jaw in place. This chuck is simple, strong and efficient. Its action is positive in either direction and there are no moving parts to break or get out of order. The jaws are interchangeable and are quickly removed and replaced.

GASKET CUTTER.

A gasket cutter of special design is shown in Fig. 56. It is turned from tool steel and may be used either by hand, with a special machine, or with an air hammer. The cutting edges are turned to size and carefully hardened. A coil spring operates the steel plug in the center and also the four ⅛-in. pins in the annular space between the cutting edges, for removing the center piece and the completed gasket. A ring with four set screws, having ⅛-in. ends bearing on the ends of the ⅛-in. pins, is fitted to the cutter, as shown. A steel



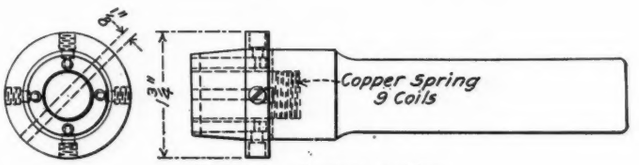


Fig. 56—Gasket Cutter.

plug 31/32 in. in diameter, is mounted on a ⅛-in. pin extending diagonally through the cutter and the ring. Slots are made in the cutter to allow movement of the plug on the pin. When pressure is applied to the tool and the gasket is cut, the plug is forced back against the coil spring. Upon releasing the pressure, the coil spring forces out the plug, the collar and the pins, which in turn push out the center and gasket. As this is automatic, gaskets can be cut very rapidly.

MOLDING GREASE FOR ROD CUPS.

A press for forming solid grease candles or sticks for rod

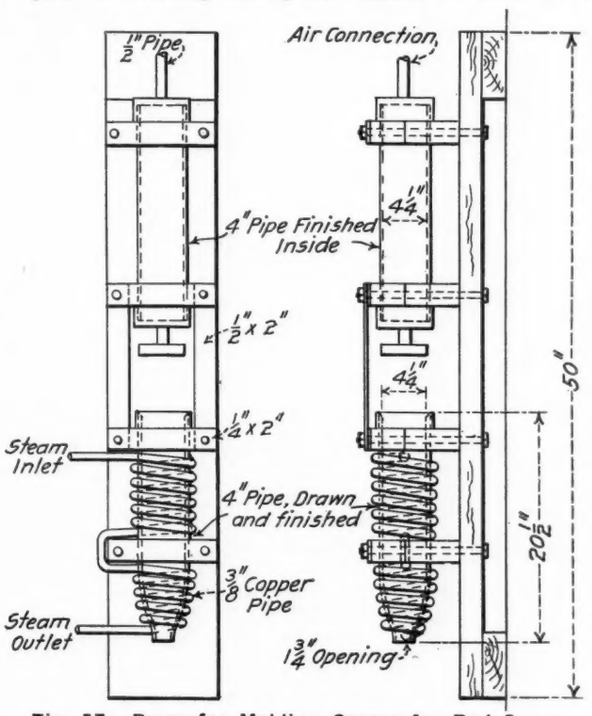


Fig. 57—Press for Molding Grease for Rod Cups.

cups is illustrated in Fig. 57. There are a number of presses made for this purpose, but the one shown has at least one feature which makes it far more efficient than other designs. A 4-in. pipe is finished inside and provided with a piston and forming head. The cylinder is mounted vertically on a 2-in. plank and the usual connections arranged to operate it with air. Just below the power cylinder is a similar cylinder drawn down at the lower end to a 1¾-in. opening. Around it is wrapped a coil of ⅜-in. copper pipe, forming a steam radiator for warming the former and the grease within. The heat reduces the density of the grease and makes it much easier to mold or form.

PACKING RING EXPANDER AND CONTRACTOR.

A device for expanding or contracting cylinder packing rings is shown in Fig. 58. They are turned to standard sizes and it frequently happens that the nearest size ring does not quite fit the cylinder. In order to make a perfect fit the ring may be altered by the use of this device. Three hardened rollers, 3 in. in diameter, are arranged as shown. The upper roller can be

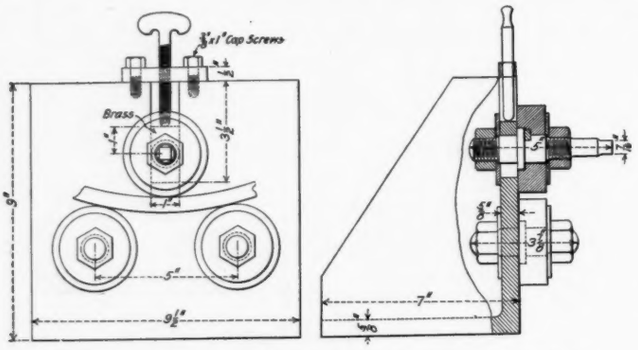


Fig. 58—Packing Ring Expander and Contractor.

adjusted vertically by a thumb-screw, and it is also keyed to a center pin, or shaft, with a square head, so that it can be turned with a crank. If the ring be too large it is placed in the device with the rollers in the position indicated and by adjusting and rotating the upper roller the circumference of the ring may be reduced in a manner similar to that of a boiler sheet in the rolls. Adjustment of the screw gives proper curvature. If the ring be too small, it is placed between the rollers in the reverse position and the circumference enlarged.

TOOL HOLDER.

A shop-made tool holder for use in lathes is shown in Fig. 59. It is made of machine steel for all sizes of lathe tools and designed to hold the tool at the proper angle and form a rigid support for the cutting edge. This will allow small-size high-speed tools to be used on heavy work without vibration and chatter. The economy in high-speed steel is also an important point. The holder is clamped in the tool post and the wedge hinged on a pin is arranged above the tool and clamped down upon it.

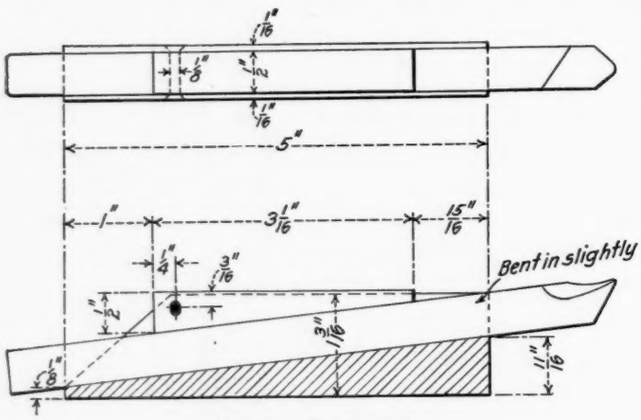


Fig. 59—Tool Holder.

PNEUMATIC HOLDER-ON.

A pneumatic holder-on for use in driving rivets and staybolts is shown in Fig. 60. The cylinder is made from a 4-in. pipe, 10 in. long, and is provided with a piston, on the rod of which snaps can be adjusted, depending on the size and kind of rivet or bolt driver. The piston head is fitted with a leather gasket. A ½-in.

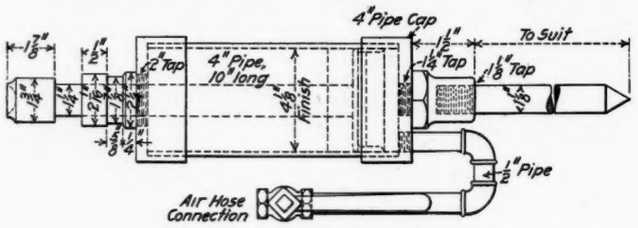


Fig. 60—Pneumatic Holder-On.

air pipe is tapped through the back head and has suitable valves for regulating the air supply. The backhead is provided with a socket for receiving centers of different lengths. This piston receives the impact of the air hammer through the rivet and compresses the air in the cylinder. This causes a reaction of the piston for each stroke of the hammer, and the tool serves the double purpose of holder-on and hammer.

SPECIFICATIONS FOR STAYBOLT IRON.

The following specifications for staybolt iron have been recommended by a committee of the American Society for Testing Materials, and have been submitted to letter ballot for adoption as standard practice by that association:

Process of Manufacture.—All staybolt iron must be hammered or rolled from a bloom or a box-pile having a cross-sectional area of at least 45 sq. in., and not less than 18 in. long, the basis of which must be pig metal and entirely free from any admixture of steel.

Physical Tests.—Tensile strength, not less than 48,000 lbs. per square inch. Elongation, not less than 28 per cent. in 8 in. Reduction of area, not less than 45 per cent. Double bending test, close in both directions without flaws. Nick and break test, a bar, nicked all around to a depth not less than 8 per cent. and not more than 16 per cent. of the diameter of the bar, and broken, shall show a clean fiber entirely free from crystallization. Vibration test, the test bar shall stand a minimum of 6,000 revolutions when subjected to the following vibratory test: A threaded specimen, fixed at one end, has the other end moved in a circular path while stressed with a tensile load of 4,000 lbs. The circle described shall have a radius of $\frac{3}{32}$ in. at a point 8 in. from the fixed end of the specimen.

Inspection.—The iron must be smoothly rolled and free from slivers, depressions, seams, crop ends and evidences of being burnt. It must be truly round within 0.01 in., and must not be more than 0.005 in. above or more than 0.01 in. below specified sizes.

Selection of Samples for Test.—The bars will be sorted into lots of 100 bars each, and two bars will be selected at random from each pile. Failure of either of these bars to meet any of the above specifications will be cause for rejection of the lot which the tests represent.

During 1909 attention has been given to the question of electrifying the Chilian government railway between Valparaiso and Santiago, 114 miles. It is proposed to complete double-tracking this line before equipping it for electric operation. An Italian company has offered to electrify the line and to take its pay out of the profits in excess of what was earned on the operation of the road by steam. It is thought that this offer may be accepted before the end of 1910.

HOW A FOREMAN CAN PROMOTE SHOP EFFICIENCY.*

BY AN "OLD RAILROADER."

This article will relate largely to the handling of locomotives at terminals in the least possible average time and at the lowest cost for handling, and for running repairs.

Hostlering—The foreman must commence at the ashpit by selecting good men and training them to handle the engines promptly and to always be on the alert to note the condition in which they are left by the engineers; first, as to water in both boiler and tank; second, as to the condition of the flues and the firebox; third, as to the amount of fire and also the steam pressure. Neglect of any one of these items may cause the needless drawing of fires and consequent handling of dead engines over the ashpit and the resulting delays. They should also report any defect they may find while cleaning the fires, as there is a question whether the engineer or the inspector will report it; they should be careful in the handling of engines to avoid the breaking of bumpers, pilots, etc., and also to see that in the handling of two or more engines when coupled the brakes are not set and the reverse bar of the dead engine is in such a position that there will be no possible chance of flattening tires, as has occurred quite frequently of late with the heavy power. The leading hostler should at all times have his work in such shape that in case a quick move is wanted of any particular engine he can handle it.

Coaling and Sanding.—The men in charge of the coaling station should be selected with great care. In some cases there are three or four kinds of coal to be delivered to the engines, the grade of coal to be used depending on the run. At some terminals from ½ to 2 or 3 tons of coal are dropped off the tender for every engine coaled, and laborers are used continually to gather it up and in shoveling it off of the manholes of the tanks. This is also true of the sand; it is scattered over the guides, driving boxes and valve gear, causing the cutting and heating of journals, etc.

The man in charge of the coaling station can reduce expenses considerably by paying close attention to the ordering of coal and sand. A delay in furnishing it may be the cause of considerable delay and expense, as engines that have to be put in the house without coal and sand will be delayed in getting out, and block the movement of other engines.

Inspection.—The inspection of locomotives as they come in over the ashpit or inspection pit is another important matter. Inspectors should be able to read and write, and should be taken from the most advanced helpers in the department to which they are assigned; they should be well acquainted with their work in order to make an intelligent report. As a rule, at present, any one can get a job inspecting, even if he does not know the front from the back end of a tender or engine; the reason for this is that the pay is small. The natural result is that in a week or two an accident happens, and in order to place responsibility for it the mechanic that had occasion to work on the tender or engine before the failure occurred is held responsible. The inspector does not care, as he can get another job at the same pay as a laborer. The mechanic has to stand a 10-day or longer suspension or is discharged, because of the neglect of proper inspection. The foreman should demand a rigid inspection of every part of a locomotive, from the pilot to the rear coupler of the tender, and when it is done he should see that all repairs are made before allowing the engine to leave the house. He must impress on the foreman under him that the work must be done, and done well. At this point some one will say, "They want the power." This may be true, but I feel safe in saying that no superintendent or trainmaster will demand a broken-down engine, or one that will fail just outside of the yard limits. Right here is where the engine house foreman gets into trouble. It is a mistaken idea for him to think for one moment that he is doing his duty by giving out a crippled engine when there is a demand for power. If the engine is not ready he should be man enough to say so. If he is a weakling when it comes to an order from the superintendent and sends out a crippled engine, and there is a breakdown, causing delays and possible loss of life, it takes a lot of explaining and at times in order to save himself some one must lose his position.

Reporting an Engine for Service.—Assuming that the engine has reached the roundhouse or repair shop, and that all reports are distributed, the work is now up to each individual foreman. They should all work hand in hand, and not be stumbling blocks in each other's way, as upon the intelligent handling of work reports depends the amount of time the locomotive will be held in the engine house. It seems to be generally understood that when the fire is not out the machinist gang foreman should report the engine ready for service; nine times out of ten he takes no account of other repairs than his own. This method results in the engine being delayed after the crew is on it, due to other work not being done. If the fire is out for boiler work, the boiler foreman gives the time he expects to be done and hardly ever consults any one else as to whether their work is done or not. These are two causes of increased expense, both at the terminal for labor and time of the crew and on the entire division due to delays to other train crews.

Importance of Employing High-Grade Inspectors.—The efficiency of any shop can be promoted by getting good men for inspectors; the foreman should not stand in his own way by using cheap labor on this work. The best men only should be selected, and preference should be given to crippled mechanics who cannot do other work. This holds true also of crippled engineers or firemen, as they know the importance attached to the work and what relation one part of a locomotive bears to another. This cannot be expected of a man just in from the country or mine. It seems to be the rule to hire the latter because of getting them cheap, but the averting of one failure will offset the cost of a dozen cheap men. I am sorry to say it cannot be seen in this light when the management is making reductions. Experience ought to have proven long ago that hiring cheap inspectors, as well as cheap mechanics, is economy at the wrong end.

Value of a Shop Schedule.—The intelligent handling of engines while undergoing repairs in the shop is another matter that the foreman should look into, and never for one day should he fail to keep his foremen acquainted with the dates he has set for getting engines out and of engines that he expects to get in, giving them an idea of the repairs they will require, so that they can look over material on hand and due, and be able to make arrangements accordingly.

Watch the Scrap Bins Closely.—He should also see that no good, serviceable material finds its way to the scrap bins, as this is one of the most fruitful sources of expense, particularly where foreign labor is used for cleaning up the shop. As a general rule they take anything from a cotter pin to a main brass; if questioned it does no good. Their orders are to clean up, and they do it with a vengeance; this results in all small parts having to be fitted up new, which means the running up of charges, both for material and labor, sometimes over 100 per cent. I will venture to say a visit to any scrap bin the morning after a shop cleaning, let it be the regular one or one made when an inspection is expected, will prove that I am stating facts. I had occasion to go by a scrap bin some time ago, and in looking it over saw a blowoff cock, that costs at wholesale close to $5.50. I knew at the time that these were repaired at a cost of $1.30 each, or a saving of $4.20 between the cost of a new valve and a repaired one. I called the foreman's attention to it, and he had the scrap gone over and found 24 valves that were in condition to be repaired. This was a saving of over $100 in about one hour's time.

Stealing Parts from Other Engines.—Another thing that increases repair costs is a practice that I am sorry to say the

*These are articles submitted in the competition on this subject, which closed April 15. Other articles on the same subject appeared in the issues of May 6, June 3, July 1 and August 5, 1910.

greater proportion of foremen favor—that of taking from one engine parts that belong to another, and, in the majority of cases, saying nothing about it. This is a fruitful source of trouble, expense and unnecessary labor, and at times has resulted in the discharge of good mechanics. The following incident shows how easily a foreman can get into trouble: An engine was reported ready for fire at 6 P. M., so that the night men could have it ready to move by morning. When the day foreman came on, the hostler started to take it out, but found that the left valve stem packing was blowing badly. The gang foreman, when asked to explain, stated that the stem had been trued and new packing and a bushing applied, and that he did not understand the reason of its leaking. The hostler undertook to move the engine again, and then the general foreman, who happened along, said there was no packing in the case. To prove it he ordered the case taken off. There was neither packing, bushing nor vibrating cup. It looked pretty bad for the repair foreman, but the master mechanic, coming by on his morning visit, happened to ask what was the matter, and when told about the trouble, said he had been standing beside the engine when the packing was put in the evening before, and could vouch for it. The three went to the roundhouse office and examined the work reports. They found that an engine of this same class had come in that night and the engineer had reported, "Valve stem packing blowing bad and vibrating cup broken." The work report showed who did the work, and, upon questioning, the man admitted that he took it out of the shop engine and supposed his helper had tightened up the packing case or gland again so it would not get lost. Ten days was the net result for him; it would have been a discharge for the foreman. All of the above material could have been secured at the storeroom in five minutes' time, and with no labor, but the rule is, "Let the other fellow get it"; "I will take this, as all fitting and trying is done, and while I am working taking it off of one engine perhaps a heavy job will be passed up to the other fellow," is the mutual resolve of 80 per cent. of the running repairmen to-day, provided their foremen tolerate it, and the other fellow is afraid to go to the "old man" to make a kick for his rights..

I have seen an engine raised up so a set of spring hangers and springs could be taken out to be used on another engine, simply because it was raining and the men would get wet going to the spring rack. Hangers were taken because they did not want to lay off the holes and chip out the gibs. The above are samples of how expenses creep up, both in labor and material; in tolerating such work no foreman can reduce operating expenses.

Carelessness in Removing and Replacing Parts on Engine.—So much for running repairs. The classified are no better in the majority of shops, as to attention paid to material removed while engine is undergoing repairs. When taken off it is thrown down any place, so it is out of the way. It is not even marked as to the side or location on the engine, and no attention is paid to it until the parts are to be assembled; then everybody gets busy, and if it cannot be found the blame is laid on Smith or Brown, of the repair gangs, and a new piece is ordered and fitted up to replace it. The writer can remember, when learning his trade, that every nut and stud had to be accounted for when the engine was being assembled. It was considered nearly a case of suspension if a dozen nuts had to be supplied for cylinder heads or steam chests. Now it is different—you can get all you want, and more, without a question. A nut or bolt that was found cut with a chisel in those days was a rare thing indeed. Look in the scrap bins to-day and you will find them, not by the dozen, but by the hundred. The same is true of bolts of all sizes and lengths. No matter where they are taken from, they find their resting place in the scrap bin. Ninety per cent. of them can be used again by reducing the length, straightening, etc.

What is said above about engine work is also true, in a measure, of car work. Lately there has been a little more attention paid to bolts, brake levers, etc., than formerly, but still an improvement can be made by any foreman who has his company's interests at heart.

Cleaning Up Wrecks.—The handling of scrap at wrecks and the cleaning up afterward, is also done very carelessly. The practice is for all iron to be loaded in cars and consigned to the local storekeeper, who, upon receipt of billing, as a rule, reconsigns to some general repair station, not realizing that there may be engines and cars waiting at his own station for some of the parts that he is shipping 300 or 400 miles away. It is a rare case where scrap is being loaded for any inspection or sorting to be done in order to retain good material.

The above are places where savings can be effected by intelligent foremen and close attention to details, and if looked after as they should be there would be no reason for the carrying of excessive stock for repairs. The money tied up in material could be used for labor in making repairs. At the least calculation, a reduction of 50 per cent. could be made in stock carried at a good many terminals.

Handling of Material About the Shop and Prompt Attention to Repairs.—The portage of material to and from engines to the various shops for repairs consumes considerable time and labor, and should be done in such a manner that there will be no idle trips. It takes as much time to return to the engine with an empty wagon or truck as it does to bring the material for repairs. It is an easy matter for any foreman, when repairs are completed, to make it his business to get the material out of his way and to the engine to which it belongs. If all would do this there would be far more work done and the labor cost would be reduced in proportion. Each gang foreman should keep posted as to the date set for any engine to go out, but should not try to retard it to that particular date. Let him try to get his work done a day, or even two or three days, earlier. There are some who put it off to the last, and always have the answer, "She is not due out till so and so. I have other work to do"—and it often happens that this work is on an engine due to be out perhaps ten days later. The machine and blacksmith shops are always accused of holding back the work, and on the face of it, at first glance, it appears to be true, but I can say from experience that they are not always to blame. Ninety-nine per cent. of the delays charged to these two shops are traceable to the foremen who are continually grumbling about waiting for material. If they had taken the work to them at the proper time and not given incorrect sizes, the work would have been done and the engine out without any delay. This is another place the foreman can promote shop efficiency.

Give Your Men Credit for Doing Good Work.—As to the making of jigs for duplicating parts or quick handling. A good many are being made in nearly all shops, but in rare cases does the man who devises them get credit for it, and he stops at his first effort. Some one else tries some other kink, with the same result, and he stops. Right here is where the management of our railways are losing ground. The man that does not give a machine a thought gets the credit, and it is spread broadcast over the system, while the man whose brains are in the machine, if I may use the expression, is suspended, or perhaps discharged, if he happens to make a mistake while he is studying on an improvement. If the example of private firms was followed and credit given where due, it would not be long until the effects would be seen. A greasy cap, you will always find, covers more gray matter than a silk hat, but the latter gets the credit.

The Disciplining and Handling of Men.—It will be seen that the foreman, no matter what his title, in order to promote shop efficiency must take his men in hand, commencing at the ashpit, and train them as to their duties, bearing in mind that his position is only secure as long as he has their good will. This he can obtain without losing any of his dignity as a master mechanic or foreman. In his dealings with his foremen let him be honest and tell each man his faults, not in public, but in his office, and do all his reprimanding at the same place. There is nothing that will be resented sooner than public reprimand or scolding, and this also causes the men who hear it to lose any respect they have for the man that forgets himself and shows his temper in such a manner.

If a man makes a mistake or causes trouble of any kind, have him come to the office, and there call his attention to it. You will have far better results than if the other method is used. Another thing that no foreman should ever do is to cut a workman off who wishes to speak to him. If you have not time when he approaches you, it is an easy matter to tell him to call at the office, or, better yet, make a note of it and send for him when you are in your office. He may have something which is to your interest and the company's, and it is your place to hear him, and then you can do as you choose in the matter. These points have been brought out from personal experience, and while, no doubt, they are old to some, they may be helpful to others.

BY O. D. BUZZELL,
General Foreman Car Department, Atchison, Topeka & Santa Fe, San Bernandino, Cal.

The first requisite in promoting shop efficiency is harmony among the foremen. While it is true that the individual effort of any one man can accomplish a great deal, still it will be small in comparison to the results that can be obtained by the best efforts of all the foremen working in harmony. Unless this condition exists, the employer will not be getting what is justly due him, and will be much the loser.

Adequate facilities are also a large factor and contribute much or little, as the case may be, to the general efficiency of the shop, but this is far from being all that is required, for we often see shops with very good facilities that have a very poor efficiency, and vice versa. It therefore devolves upon every foreman to make the most of what he has to work with, and to be able to convince his superiors of the great saving he could make and the additional work which could be accomplished with improved facilities.

To be a successful foreman you must be able at all times to command and retain the respect of the men who are under your charge; if you cannot do this you will hardly be in a position to maintain the respect of your superiors.

It is important that you know just how long it should take to do a certain piece of work, and insist upon having the workman complete it in that length of time, otherwise they will take advantage of you. Every foreman must keep up to date as to the best and most modern methods of doing the work, and see that the best possible facilities he is able to obtain are at hand and in condition for doing the work. The highest shop efficiency can only be obtained by specializing the work, and I have often more than doubled the output of the shop by so doing. This requires a constant study of men to determine what class of work they are best fitted to do, and, when this is determined, to see that they are kept on this particular class of work. The longer and oftener a man does a certain job the better the work and the more proficient he becomes. We often hear foremen say, when the specializing of work is mentioned, that no doubt this can be accomplished in many places, but with them it is impossible. They only think so—there are few if any railway shops where specialization has been brought to the maximum point, and where a greater shop efficiency cannot be obtained by educating more specialists; and there are comparatively few shops where we cannot find mechanics and high-priced men performing work that should be done with cheaper help.

I have put laborers in charge of a competent man and used them to do all the jacking up of cars, or to do all the stripping, and have found within a little time they would do it just as well, save just as much material, and do the work in much less time than the higher priced men. By so doing I was able to have a less number of high-priced men, and the ones I did have were much better satisfied, on account of their not having as much of the disagreeable work to do. On the other hand, the laborers were given an incentive, for by proving their ability they would be advanced when an opportunity presented itself. By handling the work in this manner we are able to reduce the number of hours worked as well as to utilize cheaper labor.

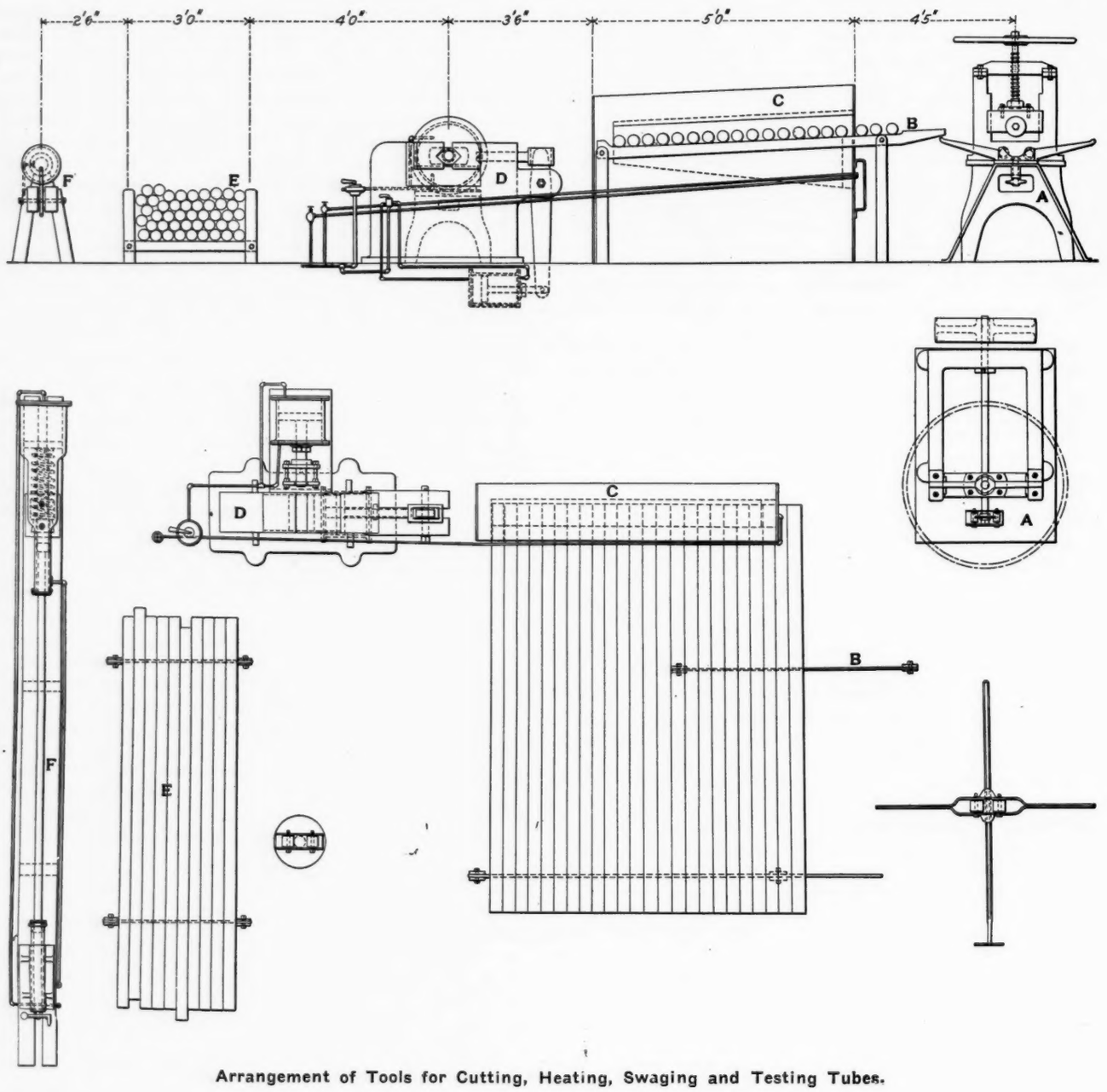
The successful foreman continually endeavors to educate the men to use their heads as well as their hands. I have noted many foremen who were wholly indifferent to this; they seemed to think that a man who was always working hard and in a continual hurry was a valuable one, while some other man, who never seemed to be in any special hurry, was of little use. If they had taken the time and trouble to check up and go thoroughly into the work that was performed, they would have found that the man who always seemed to be in a hurry had not accomplished nearly as much work as the other one had. This is where the value of time studies is apparent. Every foreman should know the quickest and best method to perform a certain piece of work, and insist upon having it performed in that manner, seeing that no time is lost in waiting for material or making unnecessary trips for it. If a man does not make as quick time on a certain piece of work as another do not abuse him, but endeavor to show wherein he has failed and try to prove to him that he should be able to accomplish as much as the other man. The results obtained by so doing will be a surprise to many foremen. Show me a man who for any length of time has been in charge of a number of men, and I can tell to a great extent the kind of men he has under him. All classes of men, to a greater extent than the majority of people believe, absorb the qualities of their superiors, be they good or bad. If a foreman expects a high efficiency from those under his charge he must first attain a high efficiency himself and accomplish what he does with an unassuming manner, and not as a blusterer and a braggart.

I have noticed that the greatest and most successful railway officials are the most unassuming in their attitude toward their subordinates, and this proves true in every vocation in life. If you are a big man, others will recognize it in a little time, and if you are not, no amount of bluster and grand stand plays on your part will make you one, or give any lasting convictions to others that you are one. No one has a greater opportunity to be a large asset in his employer's business than the foreman. So it behooves every man who occupies this position to be a credit to himself and his employer. If he expects to obtain promotion it is well for him to remember those inspiring lines of Emerson: "If a man write a better book, preach a better sermon, or make a better basket than his neighbor, though he build his house in the woods, the world will make a beaten path to his door."

BY J. T. M'SWEENEY.
Smith Shop Foreman, Baltimore & Ohio, Mt. Clare Shops, Baltimore, Md.

How to improve the efficiency and output of one's shop is something that every foreman has to be constantly studying, even to the smallest detail. He should be a reader of good mechanical books and technical journals, such as the *Railway Age Gazette* and others. There is nothing better to keep a man posted on what is going on around him, and he will get many pointers that will be of value to him.

Another way to get good results is to visit other shops and see what they are doing For instance, the writer, while visiting a large plant in New York state, noticed a furnace that was used in connection with expanding the front end of boiler tubes. It suggested an improvement for his own shop, which was put into effect and not only did away with the services of one man, who was drawing a salary of $40 per month, but made an actual saving of $22 per month in the piece work price. The old method of heating, expanding and testing tubes was to cut the tube to length by a gage on the tube cutting machine, after which it was laid on an inclined runway and rolled down to the operator at the furnace. He would take a tube and insert it in one of the three holes in the furnace. The other two holes were filled in the same manner. He would then take the tube in the hole nearest to him and place it a little forward in the furnace, so that it would get hot quicker than the others. When properly heated he would place it in the expanding machine, expand it and lay it on the floor. He would then go back to the furnace, take the tube out of the second hole, put it in the first one; then take the tube out of the third hole and put it in the second one, reach down to the runway, take up another tube, and put it in the third hole and then wait until the first would get hot enough to expand. The operator not only had a hard and laborious task, but his



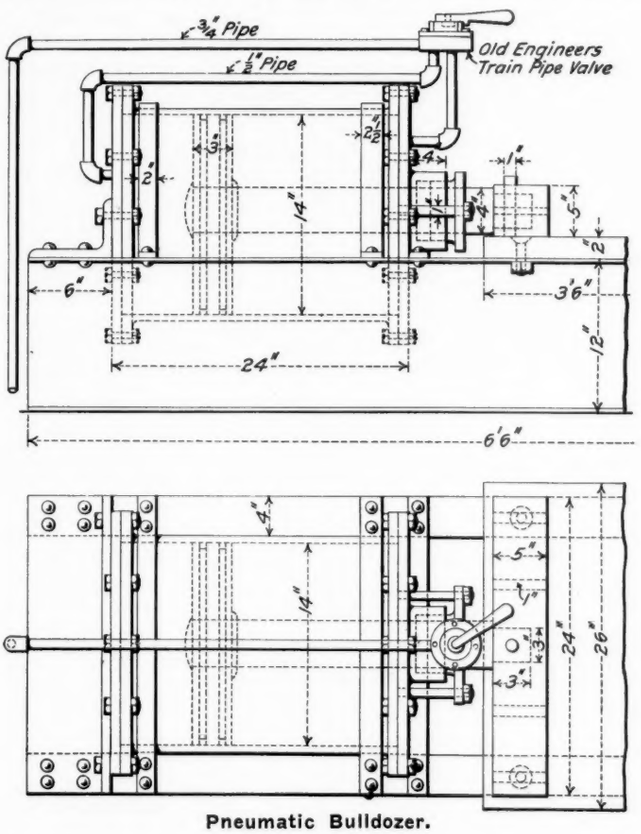
Arrangement of Tools for Cutting, Heating, Swaging and Testing Tubes.

output was poor, on account of handling the tubes many times; then the expanding machine was slow, it being of the old roller type, where the operator had to bring pressure on the rolls by screw power worked by hand, and in order to get the tubes expanded to the proper size it was necessary to use a hand gage. This gage had to be placed on the tube as it was taken out of the furnace. After it had been rolled until the operator thought it was large enough, it was taken out and the gage driven off with a hand hammer. The testing machine was placed 30 ft. out of line with the other tube machinery, making it necessary to have a man carry the tube from the expanding machine to the testing machine and test it.

In improving this condition a new furnace was made of old boiler plates. The arrangement of the new plant is shown in the accompanying drawing. The tube, after being cut to length at the cutter A, is laid on the inclined runway B, down which it rolls into the oil furnace C, after which it is expanded on the expanding machine D, which is of the plunger type, worked on the principle of a bolt-heading machine, with an air cylinder working the side gripping dies which hold the tube while the plunger comes up and expands it. The crosshead that carries the plunger also carries a gage, and as the plunger pulls out of the tube the gage pulls over it and gages it to proper size. The tube is then laid on the racks E, tested on testing machine F, and laid down ready to be taken away.

The testing machine was brought over in line with the other machinery. You will notice by reference to the drawings that the new furnace, instead of having three small holes as the old one did, has an open slot running the length of the furnace and open at one end, so that when the tube is cut off and laid on the incline it rolls directly into the furnace without any handling at all. As the furnace will hold 25 tubes, and all of them are directly in the fire, there is always one hot and ready to be expanded. As fast as the man who operates the expanding machine takes one out the cutter puts one in, making the heating operation a continuous one. It was found that with this layout the output could be increased 50 per cent., so the piece work price was reduced from 90 cents per hundred to 50 cents per hundred tubes. The testing, by reason of placing the test-

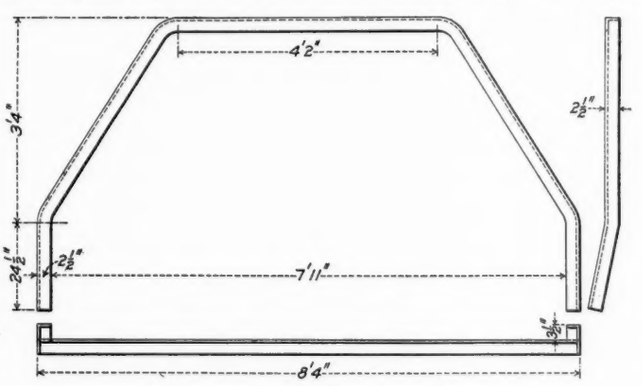
ing machine with the other machinery, enabled the piece work price to be reduced from 70 cents per 100 to 65 cents per 100. As we could get only 300 tubes to weld per day of 10 hours, the man who did the expanding could handle the 300 tubes and do the testing also. In summing up, we found that we had increased the output 50 per cent, reduced the piece work price



Pneumatic Bulldozer.

from $1.60 per 100 flues expanded and tested to $1.15 per 100, making a saving of 45 cents per 100 flues. As we handle 5,000 flues per month, the saving amounts to $22. This added to the man's salary who was done away with makes a clean saving of $62 per month, the result of one shop visit.

There were two bulldozers in the shop, and the demand for material was so great that the two machines could not keep up with it, even though there were 200 formers and dies for them. The formers and dies were of no use without machines to use



Angle Brace for Box Car Ends.

them. We built a small air bulldozer, as shown by the accompanying drawing, of materials from the scrap pile, the total cost being $30. It is doing the same work that the $1,000 bulldozer is doing. One of the first jobs performed on the machine was an inside angle brace as shown on the accompanying sketch. It was made of ⅜-in. x 2½-in. x 2½-in. x 16-ft. angle iron and used to brace the ends of box cars. As the job was a new one and hundreds of cars had to be equipped, there was a grand rush for them; in fact, they would not wait until formers could be made to bend them. A blacksmith was put on the job, and the best he could do was three per day of 10 hours, at a cost of $4.20, or $1.40 per brace. After the formers were made and put on the new machine it was found that the output could be increased from three to 24½ per day, and the price could be reduced from $1.40 to 20 cents per brace, making a clear gain of 21½ per day in output and a saving of $1.20 per brace. Still they could not be gotten out fast enough, and to meet the demand two men were kept at the machine bending and two at the furnace putting in and carrying the material to the machine. The four men work together and pool the piece work price; they are making 50 of the braces per day of 10 hours. We started with an output of three per day and raised it to 24½ per day, and then to 50 per day. The price was reduced from $1.40 per brace to 20 cents, making a saving of $1.20 per brace. As we have bent 2,500 of these braces up to date, there is a total saving of $3,000 thus far.

WALSCHAERT VALVE GEAR.*

BY BENJAMIN FREY,
Apprentice Instructor, Michigan Central, St. Thomas, Ont.

It is assumed that the reader is familiar with the Stephenson motion and understands the meaning of the different valve events. While the object is to impart a fair general knowledge of the principles of the Walschaert gear, comparison has been made with the Stephenson motion in order to better explain the characteristics, advantages and disadvantages of the Walschaert motion. At present, although there are many different styles of valve gears applied to locomotives, there are practically only two general types used in this country. One is the Stephenson shifting link motion, which was first applied to locomotives in 1843, and until recently was almost universally used in America; the other is the Walschaert radial valve gear, the general form of gear used in Europe since its invention, in 1844, by Egide Walschaerts, of Belgium. Modifications have been made in the original arrangement of the Walschaert valve gear, but the principles of its design have remained the same.

Perhaps one of the main reasons for its increasing popularity among American designers is on account of the mechanical and structural advantages it possesses over the Stephenson motion when applied to heavy locomotives. The tendency is toward larger and larger locomotives, and they naturally require larger axles, eccentrics, eccentric rods, transmission bars, etc. Because of the increased size of these parts there is hardly room enough between the frames of one of the larger locomotives to accommodate the Stephenson gear and at the same time allow for a ready inspection and adjustment of the different parts. The removal of the valve gear from between the frames not only makes it more accessible, but affords an opportunity for a better and more substantial cross-bracing of the frames. Making the frames more rigid tends to reduce the wear and tear on the whole engine, which in turn means a reduction in maintenance expenses. When applying the Stephenson motion to large engines the inertia due to the increased size of the eccentric rods, straps, etc., together with the lateral play of the driving boxes, produces greater wear on the parts, and consequently a disturbing effect on the steam distribution and a tendency to shorten the life of the Stephenson motion. With the Walschaert gear there are no large bearings, such as eccentrics, to wear; all working parts are connected by case-hardened pins and bushings, which reduce the wear to a minimum. The tendency of wear on the Walschaert valve gear is to reduce the lead.

There are more movable parts to the Walschaert gear, but its weight is not usually as great as that of the Stephenson motion. When both of these gears are in the best condition it

*This paper is being used as an introduction to a course on the Walschaert valve gear for machinist apprentices on the New York Central lines.

is generally conceded that the Stephenson motion gives the best steam distribution. When the Walschaert gear is once properly set up, the valves will remain square much longer than those of the Stephenson, and this is a strong point favoring the Walschaert motion, for if the valves of the Stephenson motion do not remain square their better steam distribution is only temporary and the economy of their setting is lost.

The Stephenson link is made to move through wide angles by the influence of two eccentrics. This produces a wedging effect on the link block, strains the gear and causes lost motion. The Walschaert link is only moved through comparatively small angles by the influence of one eccentric, and consequently there is less strain and wear on the parts. Again, the up-and-down motion of the engine on its springs affects the steam distribution of the Stephenson motion to some extent, while with the Walschaert gear this movement has no disturbing effect on the valve motion unless the connection of the eccentric rod to the link is placed at too high a point above the center line of the axles. While the proper location of this connection should be as near the center line of motion as possible, it is generally found necessary to locate it above this line in order to retain the required amount of link block travel and at the same time keep the throw of the eccentric crank within certain limits. Usually, however, the location of this point is not high enough to cause a noted irregularity in the valve's motion unless the track is very rough.

The usual form of Walschaert gear imparts its motion to the valve in a more direct manner than does the Stephenson gear, since there is no offset rocker arm to offset the motion and spring. However, some roads have introduced a direct acting offset rocker arm in connection with the gear and have thereby been able to use the same style of cylinder pattern, whether applying the Walschaert or Stephenson motions to their engines.

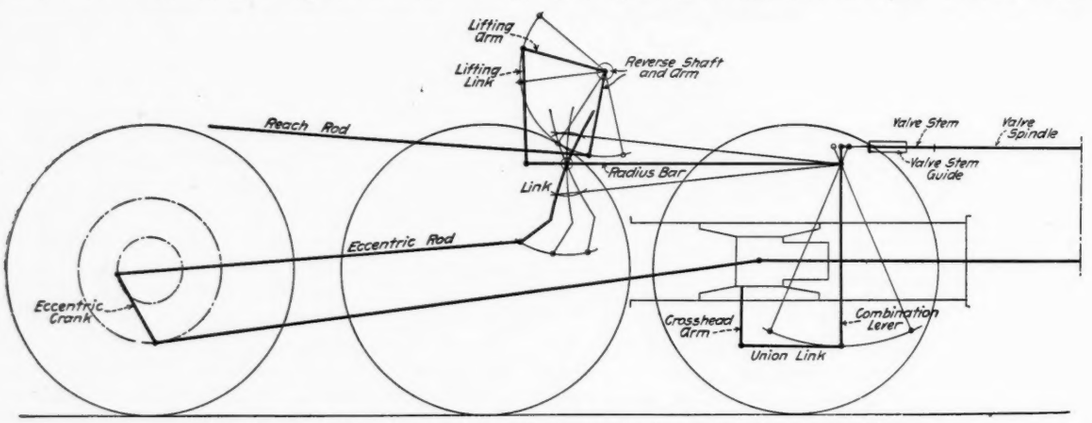


Diagram of Walschaert Valve Gear Applied to Mallet Locomotive.

In addition to the fact that the Walschaert gear is placed on the outside of the engine, it differs chiefly from the Stephenson link motion in that it requires but one eccentric or its equivalent for each cylinder to insure the movement of the valve and the proper distribution of the steam for both forward and backward motions. There are two distinct movements which control the movement of the valve: One from a single eccentric (usually in the form of an eccentric crank) and another from the crosshead. The eccentric throw governs the valve travel and reversing operations, while the crosshead motion governs the lead by moving the valve from its central position far enough to overcome its steam lap and enough farther to give the amount of port opening desired for the lead.

Another point of difference between the two motions is that the Walschaert gear gives a constant lead at all points of cut-off, while the Stephenson motion, on account of the influence of two eccentrics, produces an increase or decrease in lead as the link is hooked up, depending upon whether open or crossed eccentric rods are used; open rods are invariably used when applying this motion to locomotives, and the lead may vary in some cases from blind in full gear to ⅜ in. open in midgear. Since lead is a positive detriment to an engine when starting a heavy train, the variable lead of the Stephenson motion in this case would have a practical advantage over the constant lead of the Walscheart motion. Theoretically, the constant lead of Walschaert gear is a distinct disadvantage when applied to locomotives which are to be run at any considerable range of speed, and probably this one point of difference has had a large influence in retarding the progress of the use of the Walschaert gear.

It is still a matter of argument among experts as to whether or not lead as a port opening is really a necessity, for, while many advocate lead, it is still considered by some to be of no advantage, and even to be a detriment. It is generally conceded, however, that when running at low speeds only a small lead is needed, while at high speeds more lead is required. While these conditions are produced by the Stephenson motion, it is admitted that this increase of lead often becomes excessive at early cut-offs. The admission of steam in this case may take place too early and have a tendency to counteract the work done by the steam on the driving side of the piston. The exhaust steam is also cut off earlier, giving more than the proper amount of compression, which is only meant to be great enough to cushion the advancing piston and arrest the motion of the reciprocating parts at the completion of the stroke. Consequently, when these conditions become excessive they are a detriment to the speed of the engine.

The proper amount of lead will vary for different classes of service, and the Walschaert valve gear must be designed to give suitable lead for its particular class of service. This should seldom exceed $\frac{5}{16}$ in., as the advantage received from an earlier admission of steam would probably be more than offset by the increased compression and preadmission. Since the lead given by the Walschaert motion is governed by the designer, it follows that no alteration should be made in any of its parts to bring about an increase or decrease in its lead. If desired, however, the lead may be increased at the expense of the steam lap by cutting off the edge of the valve or rings, which would, of course, bring about an earlier admission and allow less expansion of steam. On the other hand, lead might be decreased by using another valve with more steam lap. Lead may also be increased or decreased by changing the distances between the connecting points of the lap and lead lever, but this is not considered good practice. It should be remembered that the valve, strictly speaking, is not a part of the valve gear.

With the Walschaert gear the block moves up or down in the link when the engine is reversed, instead of the link moving up or down on the block, as is the case with the Stephenson motion. The link is made to swing on trunnions through the influence of the eccentric crank. The link block, which may be in either end of the link, in turn transmits this movement to the valve through the radius bar, the forward end of which is connected to the combination lever. This connection between the radius bar and combination lever is supported and guided by the valve-stem crosshead, and forms a fulcrum on which the combination lever is made to swing by the action of the

piston crosshead. When outside admission valves are used, this connection or fulcrum between the radius bar and combination lever is placed below the valve rod connection, while with inside admission valves this fulcrum is placed above the valve rod connection. Thus it may be easily determined whether an engine with piston valves has outside or inside admission by noting where the radius bar connects to the combination lever.

The lower end of the combination lever is connected to an arm on the crosshead by means of the union link. The combination lever is commonly called the lap-and-lead lever, probably because its object is to move the valve from its mid-position an amount equal to the lap and lead when the engine is on either dead center. The amount of movement that this lever gives to the valve for each stroke is therefore equal to twice the lap plus twice the lead. Since the combination lever receives a constant movement from the crosshead, its action must necessarily remain the same at all positions of the reverse lever, thereby explaining why the Walschaert gear gives a constant lead. The throw of the eccentric crank controls the initial movement of the valve for both forward and backward motions.

The link governs the reversing operations, since it acts as a double rocker arm by controlling the movement of the link block in either the same or opposite direction to that of the eccentric rod, depending on the location of the block in the link. It follows, then, that, unlike the Stephenson motion, this gear may be classed either as a direct or indirect valve gear, depending upon whether the block is located above or below its fulcrum. As a rule, the Walschaert gear is designed so that the link block moves in the lower end of the link when the engine is running ahead. In this case the eccentric crank must always follow the crank pin by about 90 deg. when the engine has inside admission valves or precede the crank by 90 deg. when outside admission valves are used. Therefore, it depends on the position of the eccentric whether the engine will run forward or backward with the block in the lower end of the link.

The exact location of the eccentric crank should be at right angles with the plane of motion or 90 deg. to a line drawn from the point on the link at which the eccentric rod is attached through the center of the driving axle when the engine is on a dead center. Reversing the location of the blocks in the link for one motion makes it necessary to shift the eccentric crank 180 deg., thus determining whether the eccentric crank should follow or precede the main crank by approximately 90 deg.

Most articulated locomotives are arranged so that the link blocks for one engine are at the top of the link while the link blocks of the other are at the bottom of the link when the engine is in position to run. Since all the link blocks must be moved at the same time by the reverse lever, this arrangement was made in order to produce a balancing effect, and thus reduce the strain required at the reverse lever. In this case the eccentric crank of one engine follows while the eccentric crank of the other precedes the main crank, provided both engines use the same style of valves—both inside or both outside admission.

The throw of the eccentric crank is necessarily much greater than the throw of the ordinary Stephenson eccentric, since the Walschaert link acts as a reducing rocker arm and transmits to the valve only about one-third of the throw of the eccentric. The ratio between the link foot radius and the link block radius is about three to one when the block is in full gear position. As the reverse lever is hooked up, the link block is brought nearer to the center of the link and the horizontal movement of the block becomes less; this produces a shorter valve travel, and consequently an earlier cut-off. Therefore, when the block is brought in line with the center of the link it can give no movement to the valve. If in this case the engine were towed ahead, the valve would still receive a movement from the crosshead connection, and the amount of this movement, as explained before, would be equal to two times the lap plus the lead for each stroke of the crosshead. The fact that the crosshead movement controls this part of the valve's movement makes it easier to secure an equal cut-off at each end of the cylinder.

When an engine using the Walschaert gear is on a dead center the link block may be moved from one end of the link to the other without giving any movement to the valve. It is therefore necessary that the length of the radius bar should be equal to the radius of the link; in fact, it may be said that the length of the radius bar governs the radius of the link.

There are two general forms of lifting devices for the radius bar. In any case, the suspension point of the lifter must be so placed that the link block will travel as nearly as practicable on a chord of the arc described by any point of the link wherever the block happens to be when the link is swung into one of its extreme positions. The above conditions are most closely approximated by a lifter through which the radius bar slides, not swinging with the link. Practically the same results may be obtained by a properly suspended hanger, although the link block slip will be more in the backward than in the forward motion. In setting up this motion it must be remembered that the positions of the link blocks must be the same on both sides of the engine, regardless of the position of reverse lever.

Unlike the Stephenson gear, the Walschaert motion will not admit of experimental changes or readjustments in the roundhouse or on the road. There is no part that can be lengthened or shortened outside of the general repair shop, and even then there should be no necessity for alterations in the motion work. The proportions of the various parts of the Walschaert gear cannot be determined experimentally, nor should any change in setting the valves be made unless the effect of the change is known in advance. In setting up this valve motion much more dependence is placed upon the accuracy of the machining operations and in the checking up of the frame and cylinder measurements than is permitted by the Stephenson motion, which allows itself to be adjusted to compensate for certain irregularities in the machining or erecting of the different parts. Therefore, assuming that all work has been properly done, it is a much simpler matter to set the valves of the Walschaert gear than those of the Stephenson. It is also much easier and more convenient to repair the Walschaert than the Stephenson motion.

It is claimed by some that the Walschaert gear has some objectionable features which are overcome by some of the new pin-connected outside gears which use no link. Again, it is claimed that when rounding curves the Walschaert gear is subject to disturbances that tend to produce irregularity in the valve motion. However, it is well to remember that the Walschaert gear not only meets the requirements of modern locomotive design, but can be as easily applied to locomotives of odd design, in which case the Stephenson motion would probably require the addition of complicated parts, which would add considerable to its weight. On some types of modern locomotives, the Mallet compound for example, it is absolutely necessary to use an outside gear, owing to the space between frames being entirely taken up by the pipes and supports of the boiler.

A consular report says that the President of Brazil recently laid the corner stone of one of two 32,000-h.p. electric power stations which are to furnish the motive power for an electric railway between the port of Victoria and the city of Itabira, in the state of Minas Geraes. The railway will be about 400 miles long, and will tap one of the greatest sources of Brazil's wealth in iron ore. One of the large waterfalls on the river Doce will furnish the power for one of the stations, and a large waterfall on a tributary stream, power to the second station. At Itabira connection will be made with the Central of Brazil, with which it will have mutual traffic agreements. It is expected to thus land at least 3,000,000 tons of ore annually at Victoria at an estimated cost for transportation of about four mills per ton-mile. About 250 miles of an existing steam railway are to be utilized for this railway, the gage to be changed from narrow to standard. The electrical equipment is to be furnished by a British concern, the entire project being financed by British capital interested in the development of the iron-ore deposits.

MASTER BLACKSMITHS' CONVENTION.

The eighteenth annual meeting of this association was held at Hotel Cadillac, Detroit, Mich., August 16, 17 and 18. W. W. McLellan responded to an address of welcome by a representative of the mayor of Detroit and J. S. Sullivan to an address by Eugene Chamberlain, chairman of the freight car pool of the New York Central Lines. G. W. Kelly, president of the association and master blacksmith of the Central Railroad of New Jersey at Elizabeth, N. J., commented in his address on the development of the association and the value of its work. The secretary's report showed a membership of 283 and a balance in the treasury of $556.78.

OXY-ACETYLENE WELDING.

John Treacy (Gt. Nor.): Some three or four years ago experiments were begun on the Great Northern with oxy-acetylene. These experiments were at first confined to boiler work and were carried on under the supervision of the superintendent of motive power, Geo. H. Emerson. Proving successful, a system was evolved whereby the work could be carried on on a large scale. The department selected to do the work was the tin and copper department, and the results have shown that this was a wise selection, the work being nearer akin to soldering and brazing than any other branch of mechanics. A gas generating plant was constructed and pipe connections were made with all pits in the boiler and erecting shops. A force of men was then trained to do the work, for much depends on the skill and reliability of the operator, and careless work at any time means failure.

To repair a crack in a firebox or other sheet, the crack is V'd its entire length, and through the sheet, the groove being cut to a 45 degree angle. The filler used to do the welding is ¼ in. round best Swedish iron. The torch is applied, heating the sheet and the filler, the melted iron dropping into the groove until it is filled up, when the torch is again passed over it melting the surplus metal off and making a smooth solid weld. The average rate at which this kind of welding is being done is one foot per hour. The pressure at which the gas is used is four and one-half pounds for the acetylene and twelve pounds for the oxygen, which proportion has given the best results. The same method is followed in putting in a whole or a half side sheet, or a patch of large or small dimensions.

The quality of the filling material is considered of much importance and every bar is tested before using, the selection of Swedish iron for the purpose being made after experimenting with vanadium and other kinds of steel, as well as with the best makes of American iron. Seams welded in this manner are said to stand a test up to 90 per cent. of the original strength of the sheet.

As a cutting agent oxy-acetylene is wonderful, a plate ⅝ in. thick being cut at the rate of 26 ft. per hour, the cut being as clean as if done with a saw. The firebox is cut in pieces and taken out in a marvelously short time. In cutting, acetylene is used at four pounds and oxygen at sixty pounds pressure. As the work progressed its scope broadened until now it is put to every conceivable use. Cracks in mud ring corners are welded, worn places on boiler sheets are filled up to their original thickness, stay-bolt holes are filled, re-drilled and tapped out to their original size; small cracks in engine frames are welded up, cracks in link and motion work are welded, and any and all jobs with cracks or worn parts are taken care of.

To illustrate how this work has grown in volume, we are now making six hundred track leveling gages of a new design. The material used in making the carriage frames is of five-eighths and one inch steel bicycle tubing, and the six hundred frames will require a total of twenty-seven thousand welded joints. The oxy-acetylene is doing a better job on these than brazing. For cast iron welding a flux is used, the formula of which is as follows:

Ortho boracic acid (H_3BO_3)	15 parts.
Chlorate of potash ($KClO_3$)	5 "
Oxide of iron (Fe_2O_3)	3 "

The mixture must be pulverized and thoroughly mixed and kept perfectly dry in a glass jar or bottle.

The difficulty in welding cast iron is due to the carbon or graphite contained in it. The flux is used to offset the effect of this. In addition to the flux when welding cast iron, a filler or solder is prepared of sticks or rods of cast iron, rich in silicon. The rods are about ⅜ in. in diameter. The work done on cast iron consists of repairs of broken parts of machinery, the filling up of blow holes or other defects in cylinder and other castings, cracked spokes in driving wheels; we have even welded in new spokes in driving wheels where they have been altogether broken out, in fact, to such an extent has this work grown that there are five men now employed welding and cutting. That the work is a big paying proposition has been proven beyond the shadow of a doubt, and that its possibilities are still greater is also certain. I am indebted to Fred Conrath, foreman of the tin and copper shop, at St. Paul, Minn., for the data contained in this report.

George O. Hartline (L. S. & M. S.): The oxy-acetylene method of welding or the fusing together of metals by a torch having a temperature of 6,000 degrees Fahr. has made considerable progress in locomotive repair and manufacturing shops. Copper, brass, iron, or steel may be fused together readily. Railways are using oxy-acetylene plants for various purposes, including welding of machine parts—castings that would be expensive to reproduce and might hold the machine out of service a long time waiting for new parts. We repair and save a number of air pump cylinders that crack in the steam and exhaust ports and weld foundry flasks cheaper than they can be patched. We also weld blow holes in steel castings that show up after the castings are partly machined.

The question of successfully and profitably welding old firebox sheets by this method is an open one. In my opinion, sheets crack from excessive strain, crystallization, age, mud burns and various other causes. Back tube sheets often fail from the continued and repeated strains due to re-rolling or re-prossering the tubes. Is the condition of the old sheet going to warrant our welding a patch during general repairs, or should we apply new sheets and have the assurance of an engine that will run in all kinds of heavy service from one shopping to another? Our experience in the welding of cracks in back tube sheets has been that the welds will not stand the severe strain caused by the flue prosser. A few cases lasted three months, others less than a week. We are now experimenting on several patches welded on side sheets, where the mileage of the engine would not warrant a new firebox. I am unable to say how successful this will be, though the patches stood 250 lb. test pressure.

The cost of cutting out fireboxes has been greatly reduced by the use of the oxy-acetylene torch. This is done by cutting the two side sheets and crown sheets forward of the door sheet flange, also cutting out the corners of the fire sheets, so as to give a better opportunity to drive the mud ring down. Portable plants are used with wrecking cars for cutting apart the drawbar between the engine and the tender of locomotives that are derailed; also cutting apart of other heavy iron bars or rods.

P. T. Lavinder (N. & W.): Some very unexpected results have been successfully obtained in the welding of machinery and of parts of locomotives, including truck frames, wheel centers and boiler sheets, hitherto handled by much more expensive means. During the short period we have had the plant we have done quite a variety of work. Our machine was primarily purchased to see if we could not recover locomotive flue sheets by welding cracks developing in the bridges. Several experiments were made, the utmost care being given to the expansion that we realized would surely take place and possibly disturb the weld; while a number were successfully welded, the adjacent bridges broke down as we advanced from one bridge to another. Experiments were made in the direction of heating a large portion of the sheet, but without success.

While this represents practically the only work in which we have been unsuccessful, the fact remains that the plant has several

times paid for itself on account of the other uses to which it has been applied. The cutting out of a firebox sheet, either for the renewal of the entire side or for patches of any size, is now being done very quickly and successfully by oxy-acetylene. A section of a firebox sheet having a cutting edge of 7 ft. 6½ in. was cut out in a little more than a quarter of an hour, costing in labor about 6 cents, whereas by the old process of cape chiseling, it would probably have cost $3.75. The condition of the cutting edge was as good, if not a little better than if it had been done by hand. A successful job of welding a patch in the lower portion of a firebox next to the mud ring was made, the patch being about 5 in. wide by about 6 ft. long, or nearly the length of the firebox.

A most interesting article appeared in the *Railway Age Gazette* of August 5, written by Wm. G. Reyer and R. W. Clark, general foreman and boiler shop foreman of the N. C. & St. L., who seem to have given the subject a great deal of thought. Their reference to the necessity for a corrugation in welding patches in boilers to take care of the expansion where patches are applied to boiler sheets is a matter of the greatest importance; in fact, the work cannot be successfully accomplished without the employment of such means.

We have been successful in repairing such parts as cracked jaws and flanges in fluted locomotive side rods, cracked rocker arms, eccentric jaws, lift shaft arms, valve stems, shaft hangers. spokes in cast iron pulleys, rims of pulleys, engine truck frames, welding lugs in throttle valve chambers and steam pipes. With equal success we have taken care of many broken parts of machinery that would otherwise have to have been removed.

While we believe that there are going to be a great many other opportunities to make use of the oxy-acetylene in cutting, welding and repairing, it resolves itself into a commercial proposition; that is to say, will the work last as successfully as if done in the old fashioned way? We believe it will. Furthermore, everything seems to indicate that where the welds are carefully executed they have equal strength. The next feature, therefore, is the cost of labor, material and time. We have not kept an account in sufficient detail of the repair operations we have had the opportunity to handle, but it is evident it is proving economical.

G. M. Steward (Pennsylvania): We have experimented considerably and have made fairly good success in welding the car roofs on steel passenger cars. We do this with a butt weld. Underneath the welded part the roof is supported by a T iron, formed to the contour of the roof. The sheets are riveted to the T, leaving the edges about one-sixteenth apart, then welded. We have also experienced a great saving in the manufacturing of our window frames. These are pressed out of ⅛ in. steel and welded in the corner. This is done by having a cast iron frame made the proper size of the window; the sections are clamped to it with about one-sixteenth between the edges and then welded. We also use the welding apparatus on nearly all parts in the interior of the car that do not run below $^1/_{16}$ in. in thickness. We have had difficulty where we tried to weld anything thinner than this. We have made several experiments on heavy material, having one engine in service with a patch on the firebox that required 74 in. of welding to complete the job.

C. J. Fackler (Am. Car & Fdy. Co.): We build steel passenger cars exclusively at our plant. We pay an oxy-acetylene operator from 22 to 25½ cents an hour. Our metal runs from 1-64 to $^3/_{32}$ in. thick. All of the window sills are welded. We know from actual experience that it costs us not less than a dollar an hour to do this welding. If you are burning off metal it will cost $1.50 an hour, because the torch is running continuously. There is no limit to the welds that can be made with oxy-acetylene. We make them eight feet long and do not think anything of it.

G. F. Hinkins (West. Air Brake Co.): Oxy-acetylene welding is a great deal like the treatment of high speed steel. Ninety per cent. of the welding depends upon the man behind the gun. Any variation in the pressure of the oxygen has a pronounced effect on the flame. Such variations are produced by the irregular working of the oxygen reducing valve, variations in the temperature of tip expanding orifice, or particles of metal adhering to the tip, thus causing an excess of oxygen. The surplus oxygen combines with the metal and causes porous, weak, brittle welds; it also delays or prolongs the time to make a weld, due to waste of metal by oxidation. An insufficient supply of acetylene will produce an irregular contact of the molecules. Acetylene welding is an art, as much as tool dressing. Any blacksmith can dress and temper a tool in a way, but it requires an expert to dress and temper a tool the right way. It is so with an acetylene welder. A poor or incompetent welder wastes labor, burns excess gas and does a bad job. You can no more tell the average man how to do this work than you can tell him how to shoot and hit the mark. He has got to get there by close application, observation and with a deep interest in his work. We have hired what were supposed to be experienced welders, but on trial they were puddlers. That is, they puddled their work instead of making a scientific weld.

On repairs such as castings or broken parts of machines, the weld may be porous and yet be sufficiently strong to answer the purpose; but a porous weld never would do on a generator or storage reservoir that is tested at 400 pounds hydrostatic pressure; after 300 lbs. air pressure it would leak like a piece of gauze. For reservoirs of this nature the weld must be close, dense and compact as glass.

FROGS, CROSSINGS AND SWITCHES.

J. Geo. Jordan (T. & N. O.).—We have a place we do this work just outside of the blacksmith shop, 20 ft. wide, 75 ft. long, with flooring and a shed roof over it, and have special men broken in for the work. The longer you keep men on this class of work the cheaper you can do the job, as they will get to be experts. We have templates to lay the holes off for the different frogs, but the planing is by measurements. If a frog point is worn down too low at the point, you will find the guard rails worn down at the same place, and the frog comes to you for repair on account of the point being broken, or one of the guard rails is broken. My motto is to scrap the entire frog, as you never can make a first-class job on a worn-out frog. If a point should break on a good frog, you can split the point and weld a piece of steel in, and make as good a frog out of it as ever. If one of the guard rails breaks you can put another in its place at very little cost. If a switch point breaks off at the point, or is worn down, all you can do is to make a short point out of a long one. I do not approve of making a new frog out of an old rail partly worn, as the rails get very hard and crystallized. If you have to bend such rails you had better heat them, or you will break a good many in the bending machine. New frogs constructed out of second-hand rail will break much quicker than those made of new rail.

Other Papers.—Wm. F. Stanton, of J. A. Fay & Egan Company, read a paper on A Short History of the Development of Frogs and Switches. Other papers on frogs, switches and crossings were presented by T. F. Keane, of the Ramapo Iron Works; Wm. Nicholson, foreman blacksmith at the Angus shops of the Canadian Pacific, and Nap Fournier, of the Ramapo Iron Works. Mr. Keane directed attention to the value of manganese steel rolled rail for use in frogs, crossings and on curves, etc.

THE TREATMENT OF HIGH-SPEED STEEL.

L. J. Brunner (N. Y., N. H. & H.).—The secret of the successful treatment of high-speed steel is extreme care in heating, both in forging and hardening. The trouble with a great many tool dressers (especially those of the old school) is that they do not heat the steel hot enough. We follow as closely as possible the rules given by the various makers, and obtain very satisfactory results. For forging, we heat slowly through and through to a good yellow heat and forge till the tool reaches a cherry color, then re-heat and continue in the same manner until the tool is finished, when it is laid in a dry place until cold. It is then ground to shape and is ready for hardening. In all heat-

ing it is essential to maintain a good bed of fire between the steel and the blast pipe to prevent the blast from reaching the steel. Extreme care should be exercised in hardening and only the cutting edge should be heated to a good white heat, but not so hot that the point will fuse. When the proper heat is reached, the tool should be removed from the fire as quickly as possible and immersed in oil, which should be placed as near the fire as convenient. The tool must be kept in constant motion while in the oil, remaining there until it becomes black, and then removed from the oil to the air blast, which should be allowed to blow on the cutting edge until cold.

Sometimes a tool dresser will get a little careless and try to rush a tool. He may get it to the proper heat, but heat it too rapidly, with the result that it will develop cracks after it is hardened, and if these cracks are slight they may not be noticed. If this should happen with a large 3 x 1½-in. tool, such as is used on a tire or wheel lathe, it might cause serious breakage of the lathe, by reason of the point breaking off and getting wedged between the tire and the body of the tool.

When a tool is put in service and does not stand up as it should, the blame is immediately placed on the blacksmith, when as a matter of fact, it is often ruined by the man who grinds it. I have seen instances where tools were properly forged and hardened, but were spoiled by the machinist through grinding them on a dry, glazed emery wheel and dipping them in water whenever they became hot from the friction of the wheel. High-speed steel will not stand up under such treatment as this.

Every shop that uses high-speed steel to any extent should have a furnace with a pyrometer for recording the temperature.

J. B. Hassett (Erie).—My experience has been that if the instructions issued by the manufacturers for the treatment of their steel are followed and care taken in heating, forging, grinding and hardening of the tools, good results are sure to follow. In our shops at Susquehanna we have very little waste, for when a tool becomes too short for one class of work, we forge it down to the next and so on down to the smallest size. We have had no trouble in annealing this steel. If we have a number of pieces to anneal we pack them in a case hardening box, in powdered charcoal, and place the box in the case hardening furnace at the same time that we put in the case hardening box, and heat both boxes to the same degree of heat. We remove the case hardening box and let the annealing box remain in the furnace to cool off. If we have only a few pieces to anneal we heat on the top of a piece of hot iron and cover with powdered charcoal or air slacked lime. If the pieces are very large we place another piece of hot iron on top of them before covering, so as to retain the heat for a longer period. Steel annealed in this way can be machined to any desired shape. For hardening we use both compressed air and oil. In my opinion the best results for most tools are obtained from the use of compressed air, although for such tools as twist drills, reamers and the like, which require the drawing of temper after hardening, oil is probably the best.

Discussion.—A. Bennett, of the Chicago, Milwaukee & St. Paul, in a brief communication, stated that he had successfully used rock salt and water for hardening. Other members said that tools treated in this way developed small checks or cracks on the cutting edge. C. Watson, of the Illinois Steel Company, stated that his company had tested 17 different kinds of high speed steel. His experience was that the farther high speed steel was kept from water the better. To get the best results a pyrometer must be used in order to heat the tool to the proper temperature. The air used for tempering at the Illinois Steel Company is cooled by circulating through a coil of pipe in a tank of ice water. Several members emphasized the necessity of carefully following the instructions of the steel manufacturer in treating the high speed steel. Most of the trouble is caused by not doing so. Mr. Stanton, of J. A. Fay & Egan Company. spoke of his success in welding high speed steel tips on iron or machine steel. The weld is made under a hydraulic press with Lafitte welding plate.

TOOLS AND FORMERS.

Arthur Stockall (Intercolonial).—It is better to have two simple tools to make a piece of work than one complicated and expensive tool, with the danger of breaking the material. The formers for the bulldozer can be made cheaper and more conveniently with cast iron reinforced with hardened steel at the places where there is much wear. When the steel becomes worn it can be removed and a new piece put on. Where possible, the roller tool should be used as the best means to save material and power. Then there is a tool that can be used to make a lot of work, such as freight car steps, carrier irons for passenger cars and all work where a double bend is required, or a good square corner is needed. I mean a tool with a hinge so that it will move back far enough to allow the iron to be put in, and far enough apart to let the ram come down to square up the crown or middle of the work, thus making a good clean square job that no one need be ashamed of.

In all cases where cutting or punching hot material is necessary high speed self hardening steel is the stuff. It costs more to put it in, but "Oh my, how slick it does its work," and what a relief to the burdened foreman and joy to the worker. No more running water, no more burning and pealing of dies, or punch, or cutter, and consequent bending and breaking of tools, with the machine on the hog half of the time and the tool maker swearing and the workman grumbling.

Tools for Bolt Heading, Etc.—I used to think at one time that mild steel was good enough for this work, and I tried it thoroughly. It was not satisfactory. It would burr up in spite of all I could do. "Case harden it," said my boilermaker. This I did, with the result that usually the block would warp or bulge in the middle, and in grinding this out the case hardening would be gone. Then I heard a fellow say cast iron chills were fine and cheap. "Good for you," thought I, and tried this, and I found that the blocks would chip and split in two, and chilled tools in my opinion are a waste of time: good, clean cast iron tools are superior to any of the other above-mentioned for durability and economy. They can be put in and used with a little grinding, and when used up can be sold for scrap for more than scrap soft steel. But I think that self-hardening or a good water tempering steel is best for this work; it costs more, but lasts longer and does better work while it does last. For machine forgings of all sorts a good hard, tough cast steel is the best.

Steam Hammer Tools.—A dense grained cast steel top and bottom die of about .30 point carbon is used. For swages, a good hard soft steel is the best. For forming blocks use cast-iron with a wrought iron band around it to keep it from splitting and you have a tool that will make almost anything.

C. K. Abbott (St. L. S W.).—Fig. 1 shows a tool for punching slots in the split wedges so commonly used to draw tight bolts out of engine frames. This tool simplifies the job of making these wedges, and a good stock is kept on hand instead of having to hunt the place over for one. Fig. 2 is a tool for punching out half rings for center castings. These rings may be punched out of any scrap material flattened to the right thickness.

Fig. 3 is a tool for finishing up the edge of blacksmith flatters and swages, after they have been flattened down in the usual way. Put the flatter in the block and the edges are sheared off at the same heat by means of two square pieces of steel underneath, and a flat piece of steel on top. A is a block with a square hole in the center, large enough for the largest size flatter we wish to make; they should be loose in the hole. BB are pieces of steel (not hardened), and there should be several sizes on hand so that different size faces may be made. C is the flatter in place ready to receive the blow of the steam hammer. D is a piece of steel ¾ in. thick with a small handle. E is a handle to pick up the blow by. After the swage has been sheared two short pieces of round iron are placed where the blocks BB were and another piece of round iron the size

the swage is to be made is placed on top, the same as D in the former operation. A light blow and the swage has been made all but punching the eye.

A good way to make split keys is to take iron the thickness the key is to be made, double over enough to make the key, being careful to have an even heat, flatten and punch at the

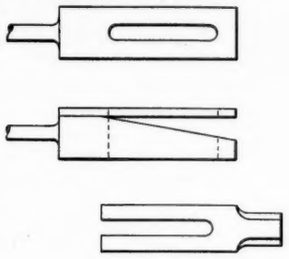


Fig. 1 Fin. Wedge.

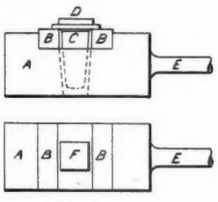


Fig 3

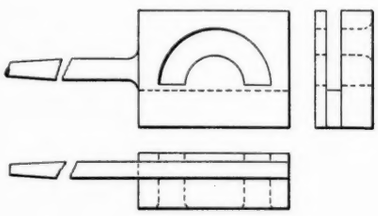


Fig. 2.

Devices Used in the Smith Shop of the St. Louis Southwestern.

steam hammer, having different size punches for different keys.

Punches for punching round holes all sizes from 1 in up to as large as the hammer die will admit of, with deep throat, serves two purposes, namely, that of punching a hole and making a washer; these punches are in daily use in our shop.

L. J. Brunner (N. Y., N. H. & H.).—Sketches of several tools were submitted by Mr. Brunner from which the three following were selected for reproduction:

Fig. 4 is a device for cutting iron, cold, under the steam hammer. For anyone who has no shear such a tool is indispensable. The shop I had charge of when I designed it had no shear and all the iron had to be cut off on the anvil, which

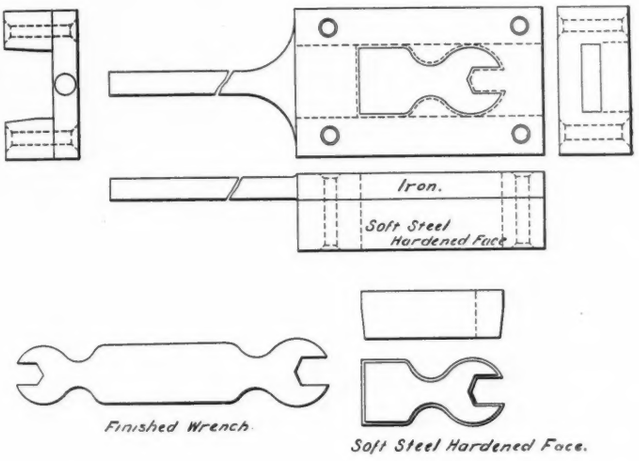


Fig. 5—Punch and Die for Making Wrenches.

was a slow and laborious task. With this tool I could cut off 2-in. round with one blow and 6 x 1-in. with two or three blows under an 800-lb. hammer. I had three sizes; one for 2-in. round, one for flat and one for ½ in. to 1¼ in., as shown

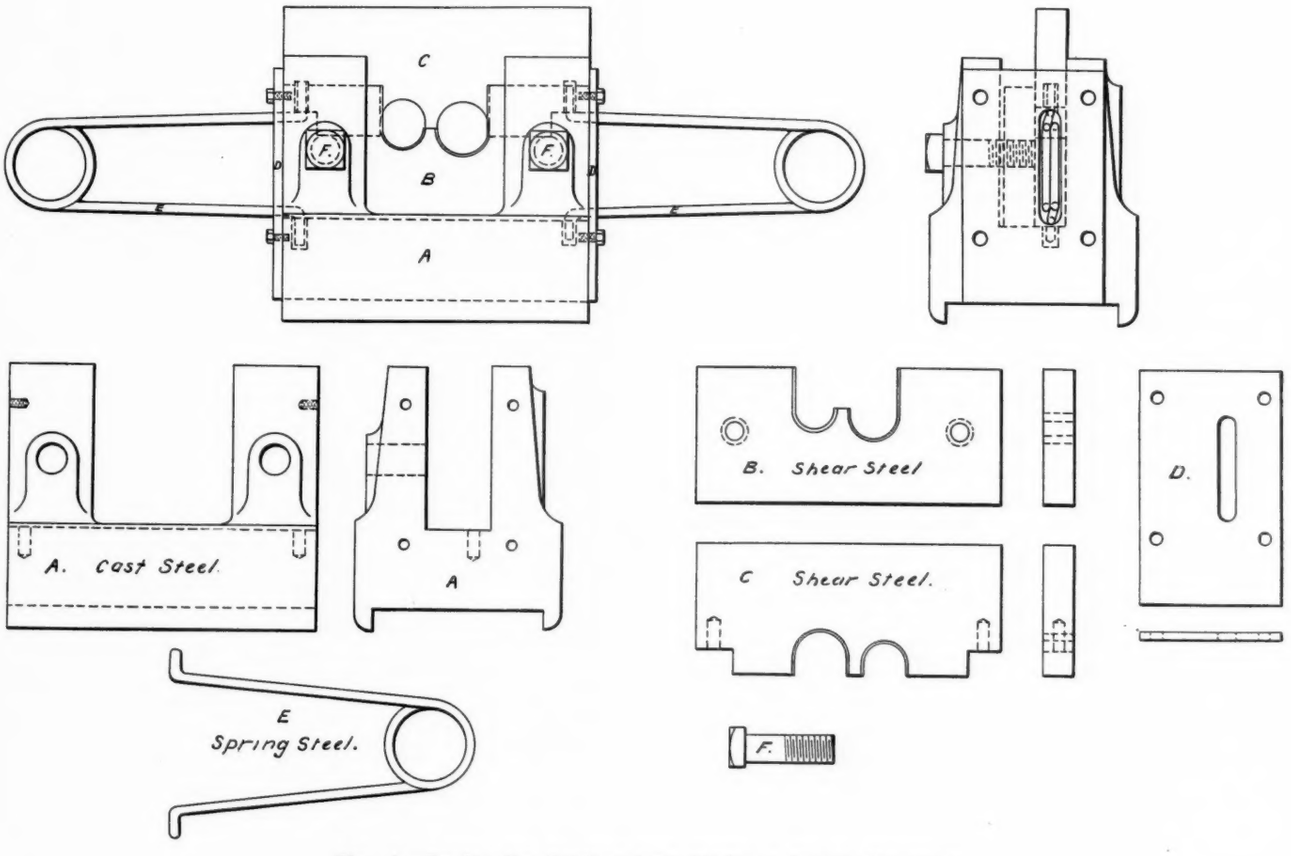


Fig. 4—Device for Cutting Iron Under a Steam Hammer.

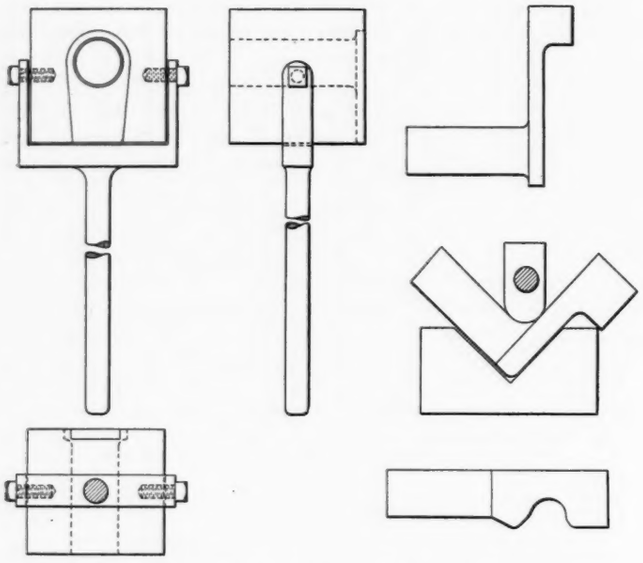


Fig. 6—Tools for Forging Rockers.

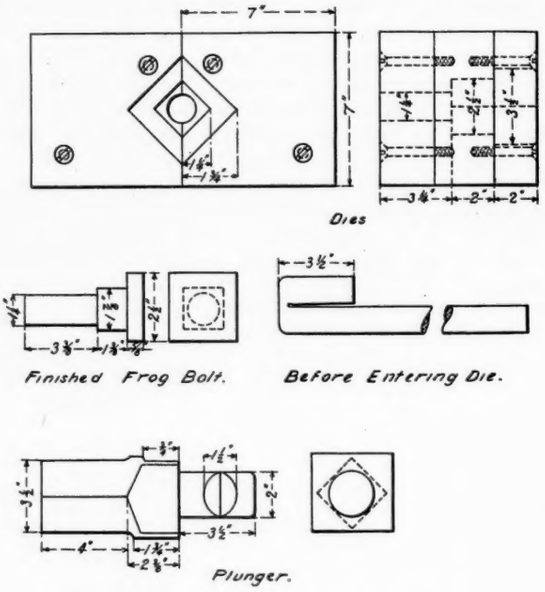


Fig. 7—Dies for Forging Frog Bolts.

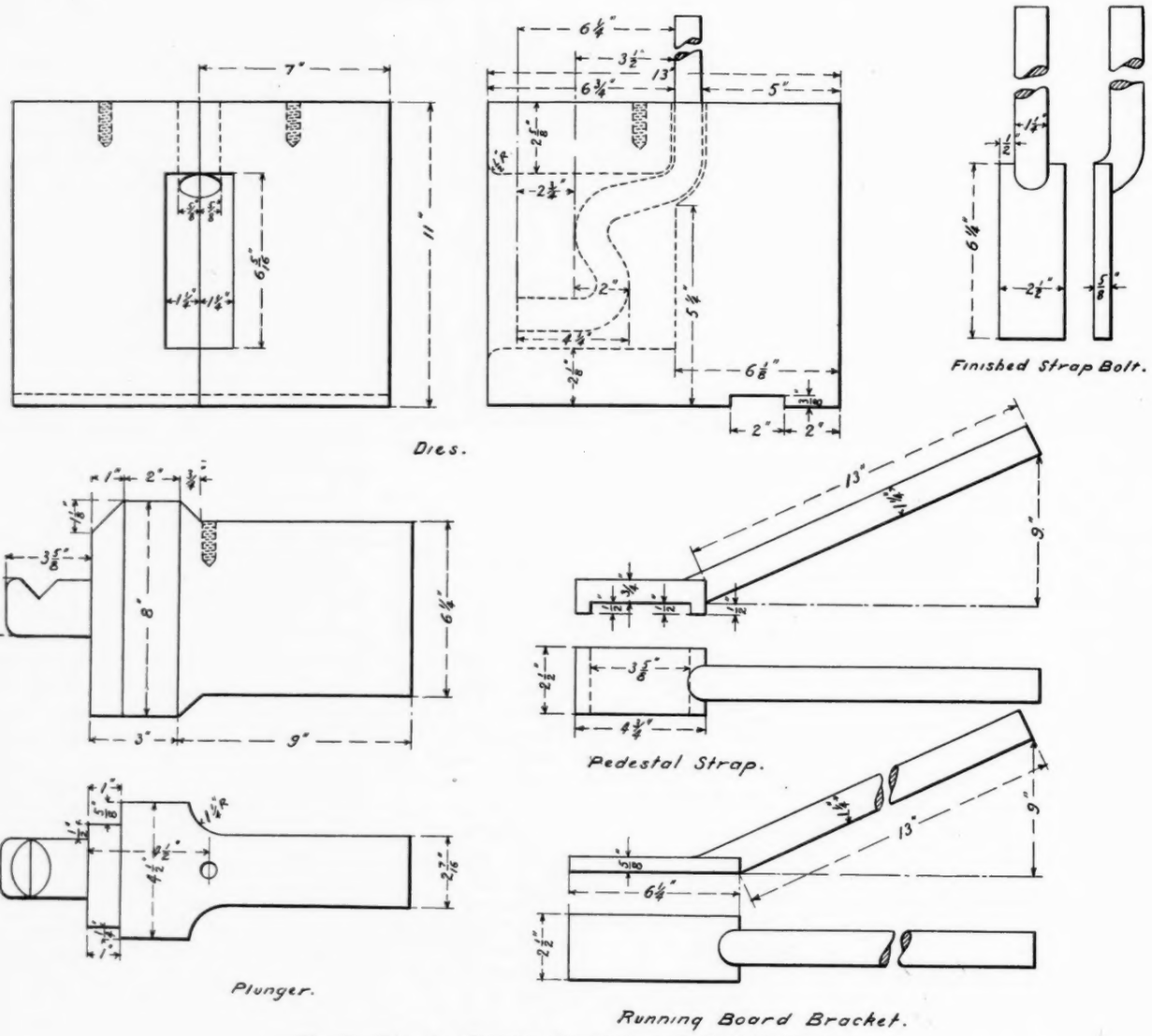


Fig. 9—Dies for Forging the Foot on Pedestal Straps.

in the sketch. The body is a steel casting made to fit the width of the hammer on which it is to be used, with gibs on each side to prevent it from sliding. The blades are made of shear steel.

A handy tool for punching out wrenches under a steam hammer is shown in Fig. 5. By having dies made to fit all sizes of nuts any combination of double-ended wrench can be made very quickly. Stamp out the large end first, using stock the same width as the opening in the die, then reverse the end and draw down to the width which the other end is to be, calculating the amount of stock necessary in the center for drawing to the required length. This style of tool can be used to ad-

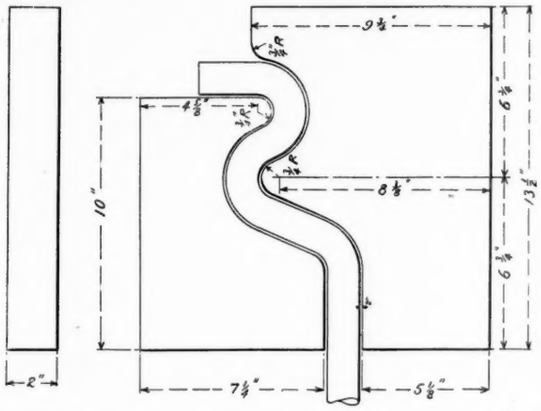


Fig. 10—Dies for Bending Material for Strap Bolt Before Forging.

vantage for a number of jobs, such as spring hanger gibs, rod strap gibs, tamping bar ends, etc.

The tools for making rocker arms are shown in Fig. 6. Splendid results are obtained from rockers made in this way, since the grain of the iron runs in the right direction for re-

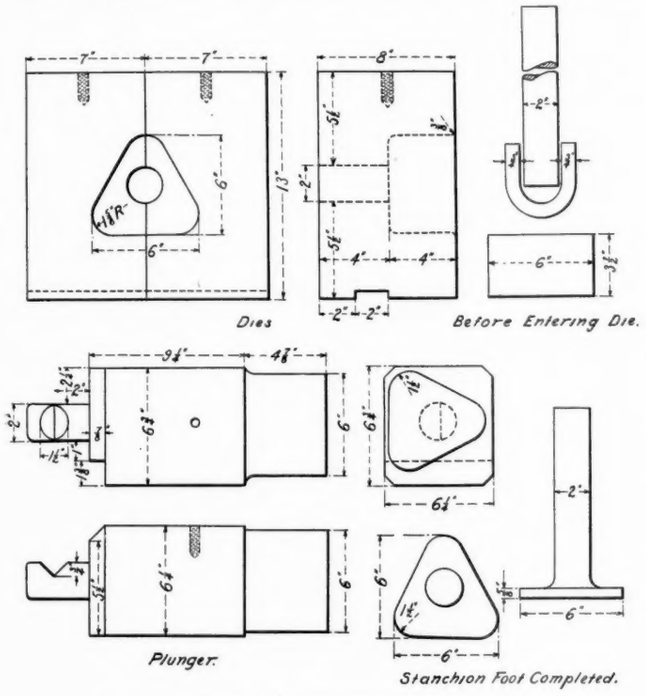


Fig. 11—Dies for Forging a Stanchion Foot.

sisting the strain on the arm. They have but one weld, which is in the center, at which point it is a rare occurrence for them to break. It requires but three heats to make each end. The body of the arm is drawn down to fit the hole in the block in the first heat. In the second heat it is checked down for the arm and bent in a V block as shown, and is completed in the third heat. It is then welded in the center with a male and female weld, the results being a very reliable arm made with the least possible number of heats.

G. W. Kelly (C. R. R. of N. J.).—Dies for making a spring frog bolt on a 3 in. Ajax forging machine are shown in Fig. 7. One end of a bar of 1¼ in. round iron, about 4 ft. long, is heated to a welding heat. It is then cut three-fourths through, 3½ in. from the end, with a hot cutter and bent over as shown, after which it is placed in the die and welded at the same heat. Engine cab ventilator bolts are made in the same way.

Spring hangers of charcoal iron are forged by the dies shown in Fig. 8, which also shows the material before and after being placed in the dies. Strap bolts and brace ends are made from 1¼ in. round iron by the dies shown in Fig. 9. The dies for bending the material before placing it in the forging machine are shown in Fig. 10. The dies for forging stanchion feet for car floats are illustrated in detail in Fig. 11.

TUBE WELDING.

John J. Roach (P. & R.).—After cleaning the tubes in a rattler in our shop they are taken to the cutting-off machine and both ends are cut off 1 in., the capacity of the machine being 70 tubes per hour. It is operated by one man and consists of two rollers on the bottom and a knife at the top, controlled by a pneumatic device. They are then placed on the testing machine, which has a capacity of 60 tubes per hour, and are tested at 350 lbs. per sq. in. This is done previous to

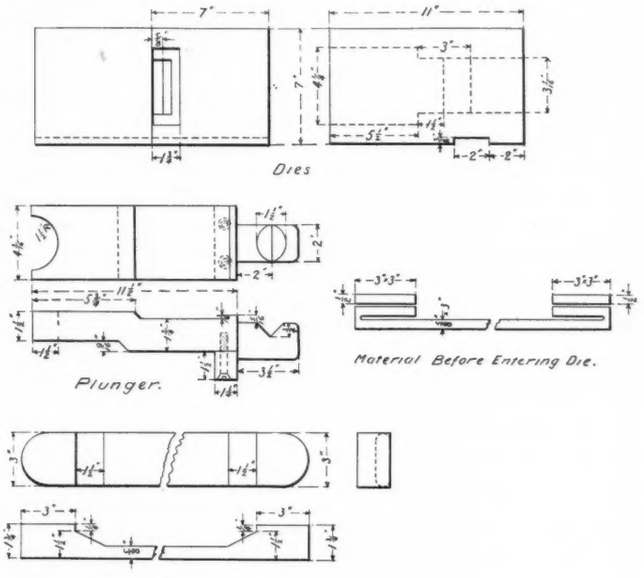


Fig. 8—Dies for Forging Spring Hangers.

welding, so as to have the percentage of leaks at new welds kept down to the lowest possible point; also for the purpose of throwing out tubes condemned at old welds, thus saving time and material. They are taken to the scarfing machine, which has a capacity of 100 tubes per hour and is handled by one man. An air chuck holds the flue while the plunger having a taper reamer, 3 in 12 in., is applied by air and inserted to a depth of ½ in., the tubes then being ready for welding.

The welding outfit consists of a Ferguson oil furnace and a McGrath air hammer having a capacity of 50 2¼-in., 65 2-in., 75 1¾-in. or 80 1½-in. tubes per hour. This machine is operated by one welder and two helpers. One helper places the tubes in the furnace and the other supplies stock and takes care of the finished flues. These are taken to the cutting-off machine, where they are cut to gage (capacity 80 tubes per hour). It has two rollers and a knife; also a grinding device to remove scale from the end that fits in the tube sheet. The

machine is operated by two men; one looks after the cutting-off knife, the other the grinder. The tubes are carried to a swelling and annealing machine, operated by one man, the flues being swelled to proper size for the front flue sheet; this machine has a capacity of 75 tubes per hour. They are then placed on trucks ready to be taken to the shop and be applied to the boilers.

Safe ends are scarfed on a scarfing machine, having a capacity of 90 tubes per hour. It has an air chuck to hold the ends, and uses a plunger having a 4-in. cutter, taper 3 in 12 in.; this is operated by air power and requires only one operator.

SPRING MAKING AND REPAIRING.

H. D. Wright (Big Four).—Manufacturing springs by machinery is the only way to handle them when large quantities are to be made. It would pay any company with 100 engines to put in a spring plant with modern machinery, for there is a saving of from 50 to 75 per cent. On the L. & N. at South Louisville they enlarged the spring plant and I am sure that T. H. Curtis, superintendent of machinery, would not have allowed F. F. Hoeffle, general blacksmith foreman, to do so if there had been no saving in it.

When you receive the steel make a test right away with each size and that saves trouble of tracing back requisition numbers, car number, when it was shipped and received; for as a rule the store department does not care to be bothered shipping back any inferior stock. We are generally asked to do something else with it, but don't let it get into your spring steel rack.

Welding on Clips.—There is a possibility that the steel may be overheated, and even if it has been brought to a welding heat it does not refine it any. I have watched the breakage of welding clips and most of them are broken from ¾ to 1 in. back from where the scarf is welded down.

Drawing Out Plates.—They should be either rolled, drawn out on an oval tool under a steam hammer, or on an oval die under a Bradley hammer; if drawn by hand, be sure that the face of the sledge is smooth and has no sharp corners on it. Flat dies under both steam or Bradley hammers leave creases, and if the rolls are not properly adjusted on long tapers, they will also cause creases. These things should be watched and avoided as creases are breaking points. After the main plates are made, all plates are nibbed, trimmed and are then ready to set and temper. In setting springs I generally leave the first and second plate stand off from ⅛ to ⅜ in., giving them a gradual taper to the top plate, leaving no set in the top plate, and seeing that every plate is properly fitted to each other.

Tempering is the vital point in a spring. I try and get the plates in the oil with as uniform a heat as possible and a bright cherry red heat; then we draw them back, and if you will watch real close when you put the plates back to draw, you will see the oil begin to check. At this time take the plates out of the furnace, give them a light tap with the hammer and all of the scale will fall off and your plates are blue from one end to the other. Don't dip them in the oil again, lay them down and let them cool off. They are easily fitted with what little heat there is in them.

Testing.—It is best to test the spring before the bands are put on. You save bands sometimes and the time knocking the bands off and putting them on again.

Making Bands.—The forging machine is the most satisfactory way for making bands, both for quantity and economy. When the bands are pressed on by hydraulic pressure it is not good practice to cool them off, for it puts too much strain on the band. It does no harm, however, to cool them off when pressed on with air machinery. In putting them on by hand give the spring maker help enough so that he can get them knocked down and into the water as soon as possible, for they will not be any too tight at the best.

These are methods that I have followed in spring making both with modern machinery, and where I had nothing but a sledge, and my trouble with springs is the least thing I have in my shop. Opinions differ in regard to the tempering oil. I have found but little difference. We use fish oil. I have not received just the right answer on durability of the springs that are tempered by compounds mixed with water to recommend it. There are too many differences in the composition of the water.

John J. Keller (Purdue University).—Last summer I was called upon to investigate the spring question in a large wagon and automobile concern. They were rolling down the ends and drawing them in an oil furnace and letting them lie for quite a while. Some they took out at black heat and some at white heat for tempering. We tested a number of the springs and found that the excessive heat, or the uneven heat and high temperature caused the trouble with them. If you heat a spring above the critical temperature you get a porous spring notwithstanding any treatment you may give it afterwards. A piece of steel will not harden until you get to a certain temperature, but when you get beyond it you open up the grain of the material. If a spring is too hard, what treatment would you give it? It can be treated, but my advice is to be careful and do not get your spring above the critical temperature. If you do get it above, allow it to cool down below the critical temperature and bring it up gradually again; you restore that material to a certain extent.

Arthur Hughes.—On the T., St. L. & W., if a car rides a little hard the conductors say it is the fault of the springs. I spoke to the master mechanic and asked him if he would not send for a barrel of graphite paint and we painted the leaves after they were cold before we banded them; we found that it kept the rust out from between the leaves, and the conductors say that after a car has been out a month or six weeks it rides much easier.

Discussion.—Several members make springs without drawing the ends. They stand up as well as the others and are easier to make.

FRAME MAKING AND REPAIRING.

Geo. Hutton (N. Y. C. & H. R.).—After discussing the best method of making an iron frame Mr. Hutton referred to the repairing of frames as follows: In repairing or the welding of broken parts of frames some blacksmiths seem to think that cast steel frames will not stand such a high heat as iron frames, when making welds, and that if we heat it as we do iron it will be burned. It is a well known fact that we can heat cast steel frames for making repairs just as high as iron and not destroy the material, because in the manufacture of cast steel frames it has gone through a much higher heat than we can give it in a forge. The failures at welds made on cast steel frames are the result of underheating instead of overheating, as many of us think. The thermit process I have not had any experience with. Oil welding I have had good success with, both on the Michigan Central and at our shops at West Albany. We use the oil weld wherever we can get expansion and contraction.

James Beattie (K. C. So.).—Not having a surplus of motive power, when an engine comes in with broken frame repairs must be made on the frame without removal, if it is at all possible, in order that the engine be gotten into service quickly. The roundhouse foreman sends in a slip that reads: "Eng. No. —— has broken frame. What can be done?" Then, in my judgment, if repairs can be made without removal, the next query is: "Can we have the engine for train No. ——?" Our plan of working is this: The machinist drops one pair of wheels and loosens the frame where necessary, so it may be opened at least one inch, whether at the backbone, the lower brace, or the leg. If in the backbone we place two bars of 3 x 6 in. across the frames wherever we can get a good butt, and extending outside a sufficient distance so that the tie rods of 1¾ in. round iron may be clear of heat. We insert a piece of good iron 1 in. thick with the grain in the right direction, and projecting at least one and one-fourth in. all around frame; then we fit the brick work, leaving as large a space as possible so the heat may taper off gradually; otherwise, if the brick is too close, the frame will waste at the edge of the brick. We have two small portable furnaces on wheels; one is placed on a straight track outside of

engine, the other on the inside to run sideways on an inclined track to the bottom of the pit. We locate these furnaces close to the brick work and place a twenty gallon tank on the running board to supply the fuel, which is crude oil. After all preparations are made the frame is welded in from forty-five to fifty minutes. If the time extends over sixty minutes the frame is wasting. We then tighten the tie rods until the frame goes back to the tram marks, and remove the furnaces. The frame will show an increased area as far as heated and without any waste whatever.

If the break should occur in the leg the opening up will produce a curvature in the lower brace and will throw the leg out of line. This can be easily remedied by applying a jack between the jaws, immediately after welding. I am not a believer in butt welding under ordinary conditions, or in shop practice, but I believe that it is the best weld possible on a frame without removal. We have had excellent success welding on the above plan.

W. C. Scofield (Ill. Cen.).—This subject has been written about and talked about at every convention since the formation of the association and most of us have returned home with the inner edge of the soles of our Sunday shoes gone from marking on the floor or ground his particularly best way of making and repairing a frame. Still the subject is before us as interesting as ever. We realize that it is not meant for us to question the design or manner of fastening to the cylinder and the boiler, but from the results of certain designs and manner of fastening, it certainly seems that more thought was given to make and put them together so they would break the easiest rather than otherwise. We believe that a frame properly designed and made by the best method and then fastened to the cylinders and boiler properly is no more apt to break than is the boiler.

In repairing we make no distinction between a wrought iron and a cast steel frame. Oil welding in many places is giving good results, but many have condemned oil simply after their first trial. The more we use thermit, the more uses we find for it. It certainly is the easiest way yet found and if properly done will be found as strong if not stronger than before broken. Oxy-acetylene has possibilities seemingly unlimited, but as yet is in an embyronic state.

J. W. Riley (Lehigh).—Very often a blacksmith foreman is called upon for his advice in patching a frame. I have a patch which I have applied a number of times in the past three years without a failure. Of course this kind of a patch cannot be applied in certain places, but where it can, it is all right and can be placed without removing the wheels. The job can be done in about eight hours, as the pins and plates can be forged and the plates drilled on one end while holes are being drilled in the frame.

THE USE OF SCRAP.

L. J. Brunner (N. Y., N. H. & H.).—There are hundreds of jobs that come into the blacksmith shop that can be made from old material, and answer the purpose fully as well as if made from new stock. In large plants where the scrap of the whole system, or from several divisions, is deposited, a good intelligent man, one who is familiar with car and locomotive work, should be stationed at the scrap bin to look over and sort all good material that finds its way into the scrap heap. It is surprising to see the thousands of good pieces that are found here that can be saved and put into service again with little or no labor. I have talked with a number of men who claimed that it did not pay to use old material. I maintain that it does pay, and pay well, if good judgment is exercised in its use. If the cost of labor to make it available is greater than the cost of new material; or if old material is allowed to enter parts requiring new material, then it is poor economy, but if properly handled a great deal of money can be saved annually.

To illustrate: Previous to the time I took my present position, there was very little if any old material used at this point. As soon as possible I inaugurated the system of utilizing scrap iron and steel for all purposes where it could be done advantageously. When I began to instruct the men as to what I wanted done some of the older hands were astonished, but I soon educated them to the point where they knew as well as I did what parts could be suitably made from old material, and the system has worked very well ever since. As soon as I got the system well established, I kept a record for my own information for one year, which showed that I had used 445,000 lbs. of old iron and steel during that period, and had rescued thousands of good parts that required very little labor to make them serviceable. When the difference in the price of the old and new material is considered it is no idle claim to state that this did pay. The extra cost of handling the scrap is very little as the man in charge of the scrap bin picks out everything he sees that he thinks is useful and lays it to one side; whenever I have a little spare time I look it over and have the laborer that wheels out the scrap from the shop bring back a load with him each trip and store it in a large bin conveniently located outside the shop.

PIECE WORK.

Thos. M. Ross (B., R. & P.).—When introducing piece work in a shop care and judgment should be used in getting up the first schedules to be put into operation, as much of the future success depends upon getting the right start. It should first be used on work with which the men are familiar and for which the facilities for handling are good; it is then much easier to proceed with the more difficult operations. Confidence must be maintained and the men convinced that you intend to be fair with them; this can be done by the foreman taking the proper amount of interest and demonstrating by the men's own work that they will be the gainers in the end and in this way securing their co-operation.

In getting up schedules and creating piece work prices we must be governed by the conditions surrounding the work and the facilities provided for handling it after it has been delivered to the workmen. In a well equipped shop you may be able to do certain lines of work for a great deal less than in other shops, and at the same time the workingman will work harder and still make more money. The system of timing workmen to ascertain the cost of performing different operations is one which calls for the use of good judgment; the foreman must take into consideration the condition of the material (if on repair work) and also the ability of the men or man doing the work, some taking more readily to one class of work than another, and also the willingness of the workmen and their ability to shirk when on work not already covered by piece work.

The proper distribution of piece work among the workmen is very important in that if any favoritism is shown it will sooner or later cause dissatisfaction among them. In case some man may have a bad run of work in which he may do his best and still not be able to make out, it is up to the foreman to see that he gets on a line of work in which he can make up his loss on the bad job and be made to forget his troubles. I have in use in my shop a system of keeping account of the earnings of my men by which I am enabled to so divide the piece work that all are getting as near their share as it is possible to give them. This shows the workmen that I am playing square with them and they do the same with me. We average 85 to 90 per cent. piece work.

Piece work has a tendency to develop the inventive genius in workmen, as when given a certain price for doing a job he begins at once to look for a quicker and easier way of doing it and excellent results are sometimes secured. Have your prices right, be fair with your men and have conditions the best you can and piece work is a success, otherwise it is a failure.

George F. Hinkens.—Establishing a piece work system is not a difficult job; it is a business proposition; all that is required is absolute fair play to the company and the men. There is not a foreman in this room but likes appreciation from his superior officer. If any of you have brought out a new stunt that saves money for your company and your master mechanic or superintendent speaks of it in praiseworthy terms, it makes you feel like doing some more, and then some. That is human nature.

Your master mechanic knows when a word of praise is worth a dollar, and when it produces a swelled head. Your master mechanic or superintendent has confidence in you; if he did not have, he would not have you. Now you play the game the same way. Have confidence in your men or, rather, have men that you have confidence in. More than all, if any of your men do a good job and in quick time, show your appreciation of the fact by telling them so. You know your man and know whether it will swell his head or stimulate the best and the good in him.

If appreciation was a salable or commercial article you would find that 50 cents worth would bring one dollar in results. Too often a deserving man is expected to take for granted the praise for his efficient work, while if he commits an error he hears from it in ten minutes. Any foreman deserving peace of mind must stand honest criticism. Quoting James Whitcomb Riley's opinion: "He who does his best, gets more kicks than all the rest." It is a good thing to be called; it shows up whether you are bluffing or holding a good hand.

I do not care whether you call it piece work, contract work, premium plan or bonus system, it all amounts to the same thing. It is only a question of how much product can you get for a stipulated amount of money, and how much your company is willing to pay. A man can do as much work for $1 as he can for $5. A shoe dealer can sell a $5 pair of shoes for $1. Now this is a case where there is a money loss in either case. Now, you can give a man $5 for $1 worth of labor, and you can give $5 for a $1 pair of shoes. This is also a case where there is a money loss in either case. Now, if the seller and the buyer understand their business there will be no money loss in either case, but it will be a business transaction and one that will be satisfactory to both parties. Selling shoes is for profit; buying shoes is also for profit, if you wish to get full service as to wear and tear.

Piece work is also for profit, it increases production and at lower than day work cost. It means less men and less machinery to get out a given amount of product. It is a profit to the workman, as he makes a profit over his day rate. Not only that, he must make good any inferior work, as that is in the agreement. Piece work is the only right and just way to work; an industrious man is rewarded for his efforts. Furthermore, there is no dispute about how much work a man should do in a given time. The price is set with justice to both parties, and it is up to the man to make good. It is not so with day work. Day work will always cause more or less misunderstanding between the foreman and some of his men, as to what constitutes a day's work. It is a source of friction. My men, all of them, want piece work simply because they need the extra money, and my company wants the product.

There is no benevolence about it, it is simply a business transaction. As to the best method for setting piece work prices, that is up to you. Piece work, however fine in principle, will not work automatically. You must use good management and be guided by sound business judgment. Herman Schnider, dean of the college of engineering, University of Cincinnati, aptly puts it when he says, "A knowledge of the limitations, the weaknesses and group subtleties of men is as requisite as a similar knowledge of material."

CASE HARDENING.

Chas. A. Slenker (Long Island):—We have been experimenting with several different compounds, including the R. C. compound, and finally decided to use it. It is much cheaper at first cost and you can use it over the second time without adding new material, therefore, reducing the cost considerably. It only requires eight hours to harden a set of laterals 1/16 to 1/32 in. in depth and it leaves a good core. The surface obtained is a great deal harder than with other methods.

Discussion.—Papers were presented by Edward Ford, C. M. & St. P.; H. Thompson, C. & N. W.; C. A. Miller, Ia. Cen.; Wm. Donahue, Pennsylvania, and Wm. Price, C. R. R. of N. J. Nothing particularly new was brought out.

A. W. McCaslin (P. & L. E.).—Some time ago I visited a shop that was considered above the average in its management; the blacksmith operating the big fire was making what should have been a side V weld in a main frame; the lay-in piece was a perfect shape and size for a butcher's cleaver. This is no exaggeration, neither was it a weld.

You will pardon me when I say that many of us do not give this weld the consideration we should. It is usually made to an angle of 90 degrees, owing to the fact that the lay-in piece requires no preparation; any old piece of square iron can be thrown in. This weld will shear in the making or in its reduction, and sometimes separates in straightening under the steam

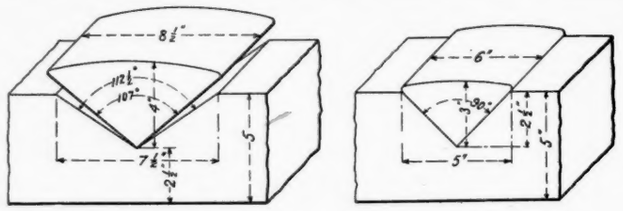


Fig. 12—Proper and Improper Methods of Making a Side V Weld.

hammer. It is more difficult to heat up at the point of the V than when the angle is less acute (wider across the top of the V).

We have another shop in mind that has what they term standard tools for preparing this weld. The top tool for forming the V cavity is made to an angle of 112½ deg., and the tool for forming the lay-in piece at an angle of 107 deg. This weld will have a lap of 7½ in. when the point of the V reaches the center of a 5-in. square bar, and of course, will carry out proportionately in a less or greater depth in different sizes of iron to be welded this way. The lap is ½ or 2½ in. greater than the cross section of the bar to be welded, and 2½ in., or 50 per cent., longer than the 45-deg. angle weld in the same size bar. The ½ and ¾-deg. mentioned above have no significance other than to be exact. These tools are easily forged and will answer for several sizes. You will note the difference in the degrees of angles in the V cavity and the lay-in piece; this permits the lay-in piece to drop to the bottom of the V cavity without shearing. The shop has many lay-in pieces of various sizes in stock..

An inferior weld is serious enough, but there is nothing in our business that adds as much to the number of failures or breakages as does the lack of fillets. There is scarcely any part of a locomotive that will not accommodate a good fillet, yet this fact is often disregarded and many avoidable breakages occur.

Election of Officers.—The following officers were elected: President, John Connors, A. & W. P., Montgomery, Ala.; first vice-president, F. F. Hoeffle, L. & N., Louisville, Ky.; second vice-president, J. T. McSweeney, B. & O., Baltimore, Md.; secretary and treasurer, A. L. Woodworth, C. H. & D., Lima, O.; chemist, G. H. Williams, Boston, Mass.

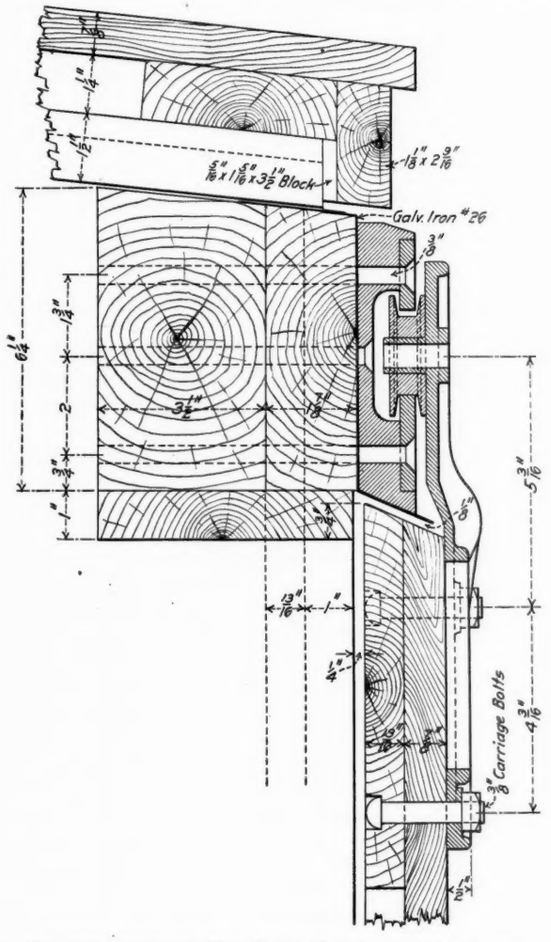
The place of meeting for next year was discussed and the names of three cities were selected, one of the three to be decided upon by the executive committee. The cities were Toledo, Boston and Denver. The secretary's salary was increased from $200 to $250 per year.

Exhibitors.—The following supply companies had exhibits in the hotel: Ajax Manufacturing Company, Cleveland, Ohio; Beaudry & Co., Boston, Mass.; Crucible Steel Company of America, Pittsburgh, Pa.; Goldschmidt Thermit Company, New York; Halcomb Steel Company, Syracuse, N. Y.; National Machinery Company, Tiffin, Ohio; Newhall & Co., Detroit, Mich.; Clement Restein Company, Philadelphia, Pa., and the United Engineering & Foundry Co., Pittsburgh, Pa.

The convention closed on the 18th, and on the 19th a large number of the members, many of them with their wives, went to Tiffin, Ohio, as the guests of The National Machinery Company. The company had an exhibition over 50 bolt, nut and forging machines—both belt and motor driven—on which demonstrations were made.

BOX CAR DOOR FIXTURES.

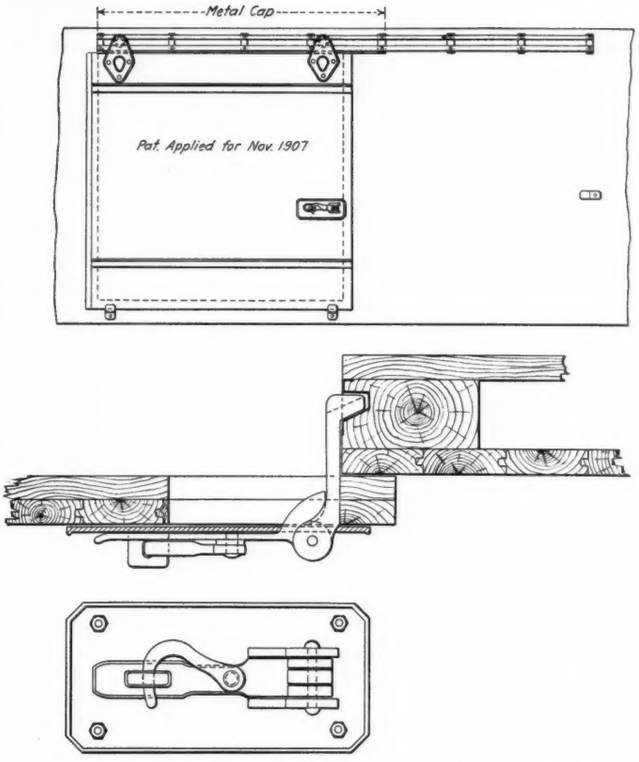
A box car, equipped with special door fixtures designed and patented by B. H. Hawkins, master mechanic; C. G. Anderson general foreman car department, and J. McAllister, boiler shop foreman, all of the Delaware, Lackawanna & Western, at East Buffalo, N. Y., has been in service for about two years, with excellent results. As shown by the drawings, the door is beveled at its top edge and a piece of No. 26 galvanized iron, placed underneath the spacing blocks, extends over it with about ⅛ in. clearance. All moisture is thus effectually kept out of the car, and the usual door cap, which is expensive to maintain and not at all attractive in appearance, is done away with. The bevel at the top of the door also prevents it from falling out at the top, even if the door hangers are removed; also, if the door should become loose at the bottom it can only swing out about 9 in. A double door track is fastened to the spacing blocks and the side plate by bolts with countersunk heads. This double rail prevents the door from "cocking" and catching. As its construction is



Arrangement of the Door Track and Hangers.

such that the rails cannot spread apart, there is no danger of the door sagging down. The track upon which the sheaves operate is only ⅜ in. wide and any snow or ice which may gather on it cannot obstruct the roller, but is easily cut away by the action of the sheave on the narrow rail and pushed aside.

Another important feature is the locking mechanism. This, contrary to the usual custom, is placed at the rear end of the door. To lock the door a handle, projecting backward along the side of the car, is pulled forward 180 deg., thus forcing the latch into the post door, as shown in the sectional view. The taper on the latch and the pocket in which it fits are such that the door is pulled tightly against the side of the car and the front end of it is forced against the door post. The door is stiffened by the



Application of the Car Door and Details of the Lock.

two 1 x 1 x ⅛ in. angles, which extend across it below the hangers and the lock. These fixtures may be applied to any box car door and are known as the Reliable door track and lock.

A CONSOLIDATION LOCOMOTIVE REPAIRED IN RECORD-BREAKING TIME.

On Wednesday, June 28, at 7.30 a. m., engine No. 1236 was taken into the Springfield shops of the St. Louis & San Francisco at Springfield, Mo., for a general overhauling. The engine was pulled out of the shop ready to couple to the tender and fire up at 5 p. m. the same day. It was backed off the transfer table and coupled to the tender at 5.15 p. m. The following description of how the work was handled is taken from a bulletin issued by G. W. Lillie, superintendent of shops.

Engine No. 1236 is one of the heaviest consolidation type locomotives on the Frisco. An idea of its size and capacity may be gained from the following data:

Cylinders	22 in. x 30 in.
Drivers	57 in.
Flues	386 2-in.; length, 11 ft. 6½ in.
Weight on drivers	187,000 lbs.
" on truck	20,000 "
" of engine	207,000 "
" of tender	148,400 "
" total	355,400 "
Boiler pressure	200 lbs.
Firebox	68 in x 108 in.
Tractive effort	43,300 lbs.

It is the practice at large eastern shops to have standard material worked up ahead to facilitate repairs and get the engines through the shop quickly, returning them to revenue service with the least possible delay. It was partially to demonstrate the value of this policy and also to demonstrate the efficiency of our organization, the loyalty of our men, and to fittingly wind up the first year of operation that this record was made.

New driving boxes, driving box brasses, shoes and wedges, rod brasses and bushings, pistons, rods and crossheads were fitted up beforehand ready for the final machine work necessary after the engine was stripped. New knee brackets for the top guide were made up and ready; also front sections of side rods which had a new style front end, and four new crank pins

It is impossible to double up on the boiler work to the same extent as on the machine work, and in order not to hold up the other men at the finish we opened up the front end and cut out the old flues the day before and had a set of flues ready to apply on the morning of the test. We attempted to keep a record of the time taken to perform the various operations, but some were lost in the hurry. The following is a log of the test, as far as we were able to get it:

Work commenced	7:30 a.m.
Front cylinder heads ....Off at 7:38 a.m.; back at	10:45 "
Links (Walschaert) ....Off at 7:38 a.m.; back at	12:00 noon.
Steam chests, covers, casings and valves off	7:40 a.m.
First valve back from planer	8:15 "
First steam chest cover back from planer	8:50 "
Started to face valve seats ....7:55 am.; last one finished	9:00 "
Second steam chest cover back from planer	9:15 "
Steam chest closed and port marks taken. Left, 9:58 a.m.; right	10:10 "
Brake rigging down	7:45 "
Smokestack off (old style)	7:48 "
New stack and base on (base laid off and drilled)	10:15 "
Air pumps ....Off at 8:00 a.m.; back at	11:59 "
A stuck bolt in left main rod strap delayed unwheeling 25 mins.	
Engine lifted off wheels by crane	8:28 "
Engine clear of running gear	8:33 "
Engine on steel blocking	8:37 "
Side rods off	8:40 "
Boxes and cellars off	8:43 "
Driving tires $\frac{7}{16}$-in. wear and sharp flanges:	
First pair driving wheels in lathe (large lathe) 8:48 a.m.; out	9:59 "
Second pair in lathe (small lathe) ....8:53 a.m.; out	10:53 "
Third pair driving wheels in lathe ....10:02 a.m.; out	10:56 "
Actual time turning, 40 mins.	
Fourth pair driving wheels in large lathe ....11:07 a.m.; out	12:00 noon.
Four new crank pins applied. Last one in at	10:37 a.m.
First driving box bored in 16 mins.	
First pair driving boxes fitted (filed); start 10:00 a.m.; finished	10:25 "
Cellars up on these boxes	10:35 "
Spring rigging down	8:45 "
Spring rigging up complete	11:10 "
Began putting up new ash pan	8:45 "
Finished putting up new ash pan	10:05 "
Binders down	8:05 "
Binders started to put up ....8:40 a.m.; finished	9.30 "
Shoes and wedges laid off at	10:30 "
All back from planer	11:35 "
Binders up after wheeling, and wedges set	3:50 p.m.
Right piston pulled	8:50 a.m.
Left piston pulled	9:00 "
Right piston in place (new)	10:20 "
Left piston in place (new)	10:28 "
Cylinder heads on with casings; striking points taken, right	10:50 "
Cylinder heads on with casings; striking points taken, left	10:28 "
Tumbling shaft down	8:58 "
Tumbling shaft back, bearings trued up and holes bushed	1:10 p.m.
Started hanging lower guide ....Left, at 9:15 a.m.; finished	10:15 a.m.
Started hanging lower guide ....Right at 9:10 a.m.; finished	9:55 "
Sixteen new guide bolts applied.	
Link brackets ....Off at 8:30 a.m.; back with new bushings	11:02 "
Both links up	12:00 noon.
Valve motion connected up complete	4:50 p.m.
Injectors ....Off 8:00 a.m.; back,	1:00 p.m.
Brake valve ....Off, 8:00 a.m.; back,	9:30 a.m.
Lubricators ....Off, 8:00 a.m.; back,	1:08 p.m.
Whistle ....Off, 8:00 a.m.; back	9:30 a.m.
Pump governor ....Off, 8 a.m.; back	9:30 "
Steam and air gages ....Off, 8:30 a.m.; tested and back	10:00 "
Boiler checks ground in. Gage cocks repaired.	
Throttle box removed and ground to stand pipe.	
Throttle valve ground to box. Lost motion taken out of throttle rigging. Throttle lever repaired.	
New gaskets applied to dome cap and steam chests.	
Relief valves repaired. New piston and valve stem packing applied.	
Began putting flues in boiler	7:30 a.m.
Started to roll flues in front end	9:55 "
Finished pinning and rolling flues in front end	1:30 p.m.
386 flues, time, 2 hrs. and 35 mins.	
Started beading back ends ....10:37 a.m.; finished	11:15 a.m.
Lifted engine off blocks	1:15 p.m.
Wheels placed	1:19 "
Let down on wheels	3:05 "
Delayed on account of trouble connecting up engine truck equalizer and spring rigging.	
Binders and wedges up	3:50 p.m.
Pressure on boiler, 225 lbs.; 9 flues to renew	2:10 "
Water out of boiler	2:53 "
Began removing the 9 flues ....2:43 p.m.; all back	3:53 "
Boiler filled with water for firing up	4:20 "
New style front-end arrangement applied with diaphragm ahead of pipe.	
Dome casing on	3:27 p.m.
New pilot on	4:10 "
Front end door rings on	4:00 "
Front end door on	4:10 "
Side rods hung complete, left side in 11 mins; done	2:37 "
Side rods hung complete, right side in 13 mins; done	2:55 "
Left main rod up ....Started, 3:46 p.m.; done	3:53 "
Right main rod up ....Started 4:34 p.m.; done	4:41 "
Tender out of shop, coaled and watered	4:50 "
Engine pulled out of shop on to transfer table	5:00 "
Engine coupled up ready for fire	5:15 "
Engine fired up next morning; no work done on engine at night	7:00 a.m.

Following is a partial work report of repairs made:

Dome cap removed; gasket new.
Boiler tested, 225 lbs. pressure.
Wash out plugs removed. Holes re-tapped.
Blow-off cocks removed.
Mud ring corners caulked.
Sixteen staybolts renewed.
386 flues changed.
Smokebox front patched. (No new casting on hand.)
Smokebox door repaired.
Smokebox netting repaired.
Petticoat pipe renewed.
New stack and base.
Number plate repaired.
New grates and bearing bars.
New Rock Island ash pan and rigging.
All brass fittings overhauled.
Safety valves repaired.
Whistle rigging overhauled.
Gage cocks repaired
Cylinders cocks and rigging new
Relief valves new.
Steam gages and connections; cab fountain, lubricators, injectors, checks and injector throttles overhauled.
New air pipe connections.
Two new feed pipes and hose.
Two new piston heads. Rods repaired.
Cylinder packing new. Valve stem packing new.
Slide valves planed. Seats faced. Yokes repaired. Stems turned up.
Balance strips repaired.
Steam chests have new gaskets. Covers planed.
Crossheads and pins new. Gibs new.
Guides (2-bar) overhauled. 16 new guide bolts applied.
Two new style knee brackets applied to upper guides.
Driving wheels removed and tires turned.
Right new driving boxes, brasses and cellars.
Right new shoes and wedges. Also new wedge bolts.
Four new crank pins applied.
Three new driving springs applied
New pilot.
New seat boxes and cushions.
Air brakes overhauled. No. 6 N. Y. pump overhauled.
All air brake parts on engine and tender cleaned and repaired.
Bell and bell-ringer repaired.
Sand box and sanders repaired.
Electric headlight overhauled.
Running boards and cab riveted to brackets.
Engine and tender painted.
Tender—Tank repaired. New side boards applied; also standard coal gates and new steps.
Tank frame repaired. New steel center casting applied at front end of frame.
Tender trucks overhauled. New column and journal box bolts.
New cast wheels on 5½ in. x 10 in. journals.

INTERIOR FINISH OF PASSENGER CARS.

In commenting on the tendency toward improving the sanitary conditions of passenger coaches, *The Painters' Magazine* has this to say from the standpoint of the painter: "The form, design, balance and all that sort of thing, in which cut-up work and ornamental features galore have until recently predominated, has been gradually abandoned. This has come about without revolutionary manifestations, and the plain, simple finish, bereft of all ornament, has for some years been gradually developing. No class of car department employees are better satisfied with the change than the painters. The car surface, clad in elaborate carvings and heavy with ornate wood embellishments, offers work in the filling and bringing up of a tedious and protracted nature, which every experienced wood finisher shuns as he would the measles. Moreover, all such work is doubly expensive—or nearly so—as compared to the cost of fetching the plain surface along through to the finish. Added to this evidence adverse to the ornamental wood interior comes the cost of keeping the finish clean and neat. To renovate a surface cut and carved into ornamental terraces, as a great many interiors up to a recent date were worked out, not only requires considerably more material of a rather expensive kind, but the labor is augmented in a majority of cases at least one-third.

"None of these surfaces can be made as sanitary, because they cannot be cleaned as thoroughly, as the plain surfaces are. Therefore, the situation on the whole promises healthier traveling accommodations and affords a better prospect for all parties to contemplate."

FOREIGN RAILWAY NOTES.

The new railway of Costa Rica provides that the sale, lease or transfer of a railway concession before becoming valid is subject to the approval of Congress.

The Central Railway of Brazil has been extended to Pirapora, on the Sän Francisco river, about 624 miles from Rio de Janeiro. The Central Railway now has 1,078 miles of line in operation.

General News Section.

At Lille, France, on Monday of this week, Louis Breget, an aeronaut, took up with him in his aeroplane five passengers; the total weight sustained by his machine, including the gasolene, being 921 lbs.

The "wheat improvement special" train of the Pennsylvania lines running this week in Indiana under the auspices of agricultural experts connected with the Purdue University experiment station proved very popular.

The Western New York Car Demurrage Association, of which C. W. Bradley is manager, is to be dissolved on October 31. The Pennsylvania, which is a party to eight or more demurrage bureaus, has given notice of withdrawal from all of them.

The Atchison, Topeka & Santa Fe has placed a standard 70 ft. McKeen gasolene motor car in service between Houston and Beaumont, Tex., a 90 mile run. The intention is to assist in the development of residence sites and serve a summer resort about midway. No immediate increase in equipment is contemplated.

On the Jamestown & Franklin division of the Lake Shore & Michigan Southern, trains are now run on the right hand track, abandoning the left hand running, which has long been in vogue. It is said that right hand running is now the rule throughout double track lines on the Lake Shore, except on the eastern division.

The Chicago, Milwaukee & Puget Sound, which suffered seriously from the disastrous forest fires of last week, announces that trains will probably be run through by September 7. A number of wooden bridges were burned down, but the total losses of the company are said to be $257,000, far less than the sums which have been mentioned in press despatches.

The arrival of the first through passenger train of the Western Pacific at Oakland, Cal., on August 23, was made the occasion of a great public celebration at that place. Oakland is the western terminus of the track of the W. P., being situated just across the Bay of San Francisco from San Francisco. The train's arrival in the Oakland station was accompanied by such blowing of whistles and other noises as commonly mark the coming in of a new year. Addresses were made to a large crowd by Walter S. Mackay, president of the chamber of commerce and chairman of the general reception committee; by Mayor Mott; by Col. John P. Irish, and by Max Thelan, representing the Western Pacific's legal department.

In a rear collision of eastbound passenger trains on the Grand Trunk, two miles east of Durand, Mich., on the night of August 24, about 11 o'clock, six or eight passengers were killed and five passengers and two trainmen were injured. The wreck took fire and some of the passengers were burned to death. The leading train was No. 14. It had been stopped on account of the brakes sticking, and the engineman and fireman of that train, who were under their engine, were badly injured. The following train was No. 4, which leaves Chicago 45 minutes behind No. 14. The rear car of No. 14 was the sleeping car and in this were most of the victims. This car was totally destroyed by fire. The reports indicate that the flagman went back a sufficient distance, but that his light and his torpedoes were both disregarded.

The New York Central has bought lands costing approximately $1,000,000 adjacent to its freight yard on the west side of New York City, on which is to be put up a building for the use of the American Express Company. The tracts bought are between 32d and 33d streets and Tenth and Eleventh avenues, just west of the new Pennsylvania passenger terminal. The express business to be transferred to this location from the Grand Central Station embraces all that is sent to and from New York over the New York Central in full carloads. This constitutes a large share of the express business done over the New York Central and it is run largely in trains composed wholly of express cars. Between the new station and Spuyten Duyvil, these trains will run over the N. Y. C. west side freight line. The buildings now used by the express company at the Grand Central Station will have to be abandoned to make way for the enlargement of the yard, and for its business which is handled on passenger trains, the express company will probably find temporarily a new location near the Grand Central.

Two ticket sellers of the Delaware, Lackawanna & Western at Hoboken, N. J., have been arrested for selling tickets a second time, returned to them by brakemen, and for altering the stubs of tickets, so that in remitting for sales they sent less than what the tickets had been sold for. The discovery of the embezzlement in connection with the tickets which were resold was made by a boy who swept out the office and who had noticed that tickets were sold on which the numbers did not correspond with the regular series on sale for that day. The embezzlement in connection with the alteration of the stubs was made possible, it is said, by the discovery that in the auditor's office the stubs were not carefully compared with the tickets taken up by the conductors. The detectives say that the embezzlements may amount to several thousand dollars.

Telephone Train Despatching on the Virginian Railway.

As heretofore announced, the telephone has been adopted extensively by the Virginian Railway for use on train wires. Between Roanoke, Va., and Deepwater, W. Va., the apparatus has been installed and is now in use. The line wires are of copper, weighing 210 lbs. to the mile. The despatcher on this division is at Princton, W. Va., and therefore has 97 miles of the line west of him and 96 miles east. At stations where an operator is not always in attendance, the telephone is fixed in a cabinet which has a door opening outside of the building (as well as one inside) so that a conductor can at any time reach the telephone and speak to the despatcher. The rest of the main line of the road will be equipped with telephones within a very few weeks. The despatchers say that the telephone lines work so well that their work is greatly simplified; "it is like taking a vacation." There is no trouble in hearing a watch tick over the line between Fagg, Va., and Page, W. Va., 157 miles.

New Laws in Texas.

The Legislature of Texas has passed, by overwhelming majorities in both houses, the bill providing that when a railway becomes bankrupt and goes into the hands of a receiver, the receivership shall not be terminated until the new company assumes the outstanding obligations of the old one. This bill has been rushed through at the demand of lawyers representing claims amounting to, it is said, over $2,000,000 against the International & Great Northern, which is advertised to be sold under foreclosure September 14. The bill was strongly opposed on the ground that it was retroactive and confiscatory, putting heavy charges ahead of mortgaged bonds.

On Tuesday of this week the Senate reconsidered the bill and adopted an amendment, the effect of which is to relieve the second mortgage bondholders of the International & Great Northern from the burden of unsecured debts of that road contracted more than two years prior to the present receivership. The Gould family's loan of $4,000,000 is unsecured and is not validated under the amendment. The Senate then passed the bill as amended.

The Legislature of Texas, at its special session, passed on Saturday last the bill requiring railways to erect buildings or sheds for the protection of car repair men and painters. The penalty for violating this law is not more than $100 for every ten days.

Trial of Alleged Illinois Central Grafters.

F. B. Harriman, formerly general manager; Charles L. Ewing, formerly general superintendent, and John M. Taylor, formerly general storekeeper of the Illinois Central, were arraigned before Judge Bruggemeyer, of the municipal court of Chicago, on August 26, and put on trial on the charge of having participated in frauds against the road in connection with the repair of its cars by various car repair concerns. Theophil Reuther, a locomotive engineer of the Illinois Central, who was associated with H. C. Ostermann in the organization of the Ostermann Manufacturing Company and was for a time a director in this com-

pany, testified that one day in 1907 Ostermann told him that he had ordered two or three barrels of paint from the stores of the Illinois Central to be used in the repair of the cars of his company and had received six or seven more barrels in the same car. He testified that Ostermann on another occasion showed him a car loaded with scrap iron from Illinois Central cars which had been repaired, which, he said, would be sold. Reuther said he protested against this way of doing business as dangerous, but Ostermann replied that "Taylor would take care of that." The witness described a stockholders' meeting in 1907 at which Taylor was present. A certificate for 1,500 shares of stock in the Ostermann company had been sent to Taylor, in return, Ostermann told Reuther, for Taylor's getting the Illinois Central to use the Ostermann company's grain doors on its cars. Taylor sent this certificate back. Ostermann then sent him 2,000 shares, which he kept. At the directors' meeting in question, Reuther was ousted as a director and, according to the witness, Taylor was elected to succeed him. A few weeks after the 2,000 shares of stock had been given to Taylor, the witness testified, Ostermann told him that he was going to send Taylor 2,000 more shares. He also testified that 2,000 shares each were given to Harriman; Joseph E. Buker, then superintendent of the car department; William Renshaw, then superintendent of machinery, and the late Ira G. Rawn, then vice-president of the Illinois Central.

Squealer at Ballinger.

The heading of this item is from the *Galveston News*. It does not refer to affairs in President Taft's cabinet, but to the "Hog-train" run by the Gulf, Colorado & Santa Fe for the instruction of Texas farmers. About 200 Runnels county farmers greeted the train at Ballinger and heard the lecture on "Hog Culture" by Professor Frazier. Interest in raising more hogs is growing among the farmers and quite a number of them are arranging to raise hogs on a larger scale.

Proposed Employers' Liability Legislation in Illinois.

Reference was made in the *Railway Age Gazette* of August 12, page 287, to the proposed employers' liability legislation in Illinois. Neither employers nor employees seem to be pleased with the proposed measure, which has been drawn by a special state commission. A representative of the building contractors of Chicago said that he would favor a plan of industrial insurance by which the building contractors would pay one-half of 1 per cent. of their weekly pay-roll into a fund for insurance to be administered by the state. Figures compiled for the Chicago & Eastern Illinois Railroad indicate that in one year the proposed law would cost this company $80,000 more than the average sum annually paid in damage claims under existing laws. Officers of the South Side Elevated of Chicago estimated that the operation of the law would increase payments on personal injury claims 40 per cent. A number of labor leaders who appeared before the commission vigorously opposed the proposed law. One of them said that it is not money that the working men want, but safe places to work; "they want to make it so expensive for employers to kill their workmen that every safety appliance known to science will be installed."

Turkish Railway Receipts.

Deputy Consul-General William Smith-Lyte, of Constantinople, reports the receipts of Turkish railways from January 1 to April 10, 1910, and the increase thereof as compared with the same period in 1909, as follows:

	Receipts.	Increase.
Turkey in Europe:		
Oriental Railroad	$816,398	$92,331
Saloniki-Dedeagatch	268,425	109,589
Saloniki-Monastir	185,052	31,218
Turkey in Asia:		
Anatolia R.R.: Haidar-Pacha-Angora.	334,276	88,177
Eskir-Sheir-Konia	114,458	20,493
Pagdad Railroad.	24,132	5,264
Smyrna-Cassaba	265,461	21,252
Syrian Railroad	401,424	12,085
Aiden Railroad	364,809	2,036
Mersine-Adana Railroad	69,806	13,288
Totals	$2,844,241	$395,733

The receipts on the Saloniki-Dedeagatch line were influenced to a large extent by the sums paid for the transport of troops. On the other hand, the Anatolian lines to Angora and Konia were not affected by such military transport, and yet show an increase of 35.8 per cent. and 21.8 per cent., respectively, during the period under consideration. On the small section of the Bagdad line open to traffic there is also an increase of 27.9 per cent.

This general increase in the traffic receipts has continued since the end of April, and according to the latest published statements of the Anatolian and Oriental railways, the total increases as compared with last year, from the commencement of the year to the end of May on these two railways, amount in round figures to $110,000 and $180,000, respectively.—*Wall Street Journal.*

Master Car and Locomotive Painters' Association.

At the 41st annual convention to be held at St. Louis, Mo., September 13-16, the following papers will be presented:

"Will the Use of Oil or Emulsion Car Cleaners Extend the Shopping Period of Exterior Varnished Surfaces of Passenger Equipment?" "How Should It Be Used to Obtain the Best Results?" By H. N. Butts, New York Central; J. T. Houser, Cumberland Valley, and John B. Ayers, Utica & Mohawk.

"Is It Economy to Keep a Practical Painter in Roundhouses to Look After Things Generally?" Discussion to be opened by A. J. Bush, Delaware & Hudson.

"Quality versus Quantity in Shop Output." By Charles A. Cook, Philadelphia, Baltimore & Washington.

"Is it Possible for the Painter to Overcome the Difficulty Caused by the Effect of Steam Heat, in Passenger Coaches, on the Glue Used in Holding Veneer?" By Charles E. Coop, Boston & Maine; B. E. Miller, Delaware, Lackawanna & Western, and A. S. Baldwin, Barney & Smith Car. Co.

"Considering the Health of the Workmen, Should We not Seek a Suitable Substitute for White Lead for Exterior Painting?" Discussion to be opened by J. H. Pitard, Mobile & Ohio.

"Report of Test Committee." By W. O. Quest, Pittsburgh & Lake Erie.

"Organization of the Paint Shop Force on a Piece Work Basis in Detail, With Reference to a Specific Daily Output of Repair Work; also Shop Management Practically and Clerically to this End." By H. H. Heffelfinger, Pennsylvania, and W. E. Estabrook, Delaware, Lackawanna & Western.

"The Best Method of Treating Structural Aluminum on Interiors of Steel Passenger Cars." Discussion to be opened by John Gearhart, Pennsylvania.

"Inert Pigments: Their Use and Abuse." By Anderson Polk, Lowe Bros. Co.

"Does the Practice of Repeatedly Coating with Body Color Affect the Burning Off Period?" By R. J. Kelly, Long Island; O. P. Wilkins, Norfolk & Western, and Melton J. Amery, New York & Quebec.

"Rushing Cars through the Shops for Paint and Varnish, and Claims for Damages by Passengers for Soiled Clothing and Shoes; Remedies." Discussion opened by J. T. McCracken, Interborough Rapid Transit.

"An Ideal Railway Car Paint Shop Embracing Construction, Convenience and Shop Location." By W. O. Quest, Pittsburgh & Lake Erie.

"Canvas Roofs—What Have We Learned in the Past Few Years Regarding their Painting and Maintenance." By Dr. E. W. Powers, Erie; John F. Lenfersick, Pennsylvania, and George R. Kinsey, Baltimore & Ohio.

Roadmasters' and Maintenance of Way Association.

The twenty-eighth annual convention of the Roadmasters' and Maintenance of Way Association will be held at the Great Northern hotel, Chicago, September 13-16, 1910, being called to order at 10:30 a. m. on September 13. The following subjects will be discussed at the meetings:

Proper Care of Track Material and Tools.
Cattle Guards.
New and Improved Appliances, including Ties.
Standard Switch Target.
Rail Fastenings, including Insulated Joints.
Tie Plates and Rail Anchors.
Paper on Treated Timber by J. L. Single.
Paper on subject to be selected by himself, by W. M. Camp.

Topical questions for discussion: (a) Dressing of Gravel Ballasted Track. (b) Paving of Ditches. (c) Length and Size of Ties. (d) How to Drain the Midway of Double Track, Whether by Surface Ditches or by Tile Drains. (e) Should the Gage on Curves be Readjusted to the Side of the Rail Head and by Moving Which Rail. (f) Quality of Track Labor.

The officers report a greater increase in membership this year than in any past year and a large attendance is expected. James Sweeney, roadmaster, Denver & Rio Grande, Salida, Colo., is president, and Walter E. Emery, chief engineer, Peoria & Pekin Union Ry., Peoria, Ill., is secretary.

American Railway Bridge and Building Association.

The twentieth annual convention, which was scheduled to be held at Fort Worth, Texas, October 18-20, 1910, has been changed to meet at Denver, Colo., on the same dates.

American Association of Railroad Superintendents.

The meeting of the association for this month will be held in St. Louis, Mo., September 9-10, instead of on the 16th, as previously announced.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; next meeting June 22, 1911; Niagara Falls, N. Y.
AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
AMERICAN ASS'N OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penna. Co., Toledo, Ohio.
AMERICAN ASS'N OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; Sept. 9-10; St. Louis.
AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; semi-annual, Nov. 16; St. Louis. Mo.
AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 18-20; Denver, Colo.
AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASS'N.—E. H. Fritch, Monadnock Bldg., Chicago; March 21-23, 1911; Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9, 1911; Detroit, Mich.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Building, Chicago.
AM. RAILWAY TOOL FOREMEN'S ASS'N.—O. T. Harroun, Bloomington, Ill.
AM. SOC. FOR TESTING MATERIALS.—Prof. E. Marburg, Univ. of Penn., Phila.
AM. SOC. OF CIVIL ENGS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; annual, Jan. 18-19, New York.
AM. SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York,; annual, Sept. 27-29; St. Louis, Mo.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 29th St., N. Y.; annual, Dec. 6-9; New York.
AMERICAN STREET AND INTERURBAN RAILWAY ASS'N.—H. C. Donecker, 29 W. 39th St., New York; Oct. 10-14; Atlantic City.
ASSOCIATION OF AM. RY. ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911; New Orleans, La.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May, 1911; Montreal, Can.
ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—G. B. Colegrove, I. C. R.R., Chicago; annual, Sept. 27-30; Chicago.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911; Boston.
ASS. OF TRANS. AND CAR ACC. OFFICERS.—G. P. Conard, 24 Park Place, N. Y.; Dec. 13-14, Chicago; June 20-21, 1911, Cape May City, N. J.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
CANADIAN SOCIETY OF CIVIL ENGS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays; Montreal; annual, last week January.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
ENGINEERS' SOCIETY OF PENN.—E. R. Dasher, Box 704, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton bldg., Pittsburgh; 1st and 3d Tues.; annual, Jan. 17, 1911, Pittsburgh.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; 20th annual, June 21, 1911; St. Paul, Minn.
GENERAL SUPERINTENDENTS' ASS'N OF CHICAGO.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thursday; Chicago.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; next convention, Omaha, Neb.
INTERNAT'L RY. FUEL ASS'N.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INT. RY MASTER BLACKSMITHS' ASS'N.—A. L. Woodworth, Lima, Ohio.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
MASTER CAR BUILDERS' ASS'N.—J. W. Taylor, Old Colony Bldg., Chicago.
MASTER CAR AND LOCO. PAINTERS' ASS'N OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; annual, St. Louis, Sept. 13-16.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, ex. June, July, Aug. and Sept.; Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
NORTH-WEST RAILWAY CLUB.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d. Mon., ex. June, July, August; St. Paul and Minn.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Blk.; Second Wed.
RAILWAY CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City; 3d Friday in month; Kansas City.
RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa., 4th Friday in month, except June, July and August; Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; annual, Oct. 11-13; Richmond, Va.
RAILWAY S'KEEPERS' ASS'N.—J. P. Murphy, Box C. Collinwood, O.; annual, May, 1911.
RICHMOND RAILROAD CLUB.—F. O. Robinson; 2d Monday; Richmond.
ROADMASTERS' AND MAINTENANCE OF WAY ASS'N.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; annual, Sept. 13-16; Chicago.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Oct. 25 and 26; Hotel Chamberlin, Old Point Comfort, Va.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
SOUTHERN & SOUTHWESTERN R.R. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo; 1st Sat.; annual, May 6, 1911, Toledo.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; 1st Sat. after 1st Wed.; annual, Dec. 13.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
TRAIN DESPATCHERS' ASS'N OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911; Baltimore.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The St. Louis, Brownsville & Mexico, controlled by the St. Louis & San Francisco, now maintains, with its connections, regular through freight service between New Orleans and the city of Mexico, crossing the Rio Grande by the new bridge at Brownsville.

The Traffic Club of Chicago had an outing at the Homewood Country Club on August 25. J. W. Prindiville won the club's golf championship cup and H. Gower was runner-up. There was also a baseball game. The next outing of the club will be held at the Exmoor Golf Club the latter part of September.

Bates & Chesebrough, shipping agents, of San Francisco, announce that in October they will begin running a direct steamship line from that city to connect with the Panama Railroad, using three steamers, and that they will have one connecting steamer on the Atlantic to run to New Orleans, Charleston and New York.

The New York, New Haven & Hartford has issued revised demurrage rules to go into effect October 1 in which the free time for loading and unloading cars will be 48 hours, thus ignoring the Connecticut law requiring an allowance of 96 hours, which at present is the rule very generally throughout Connecticut, Rhode Island and Massachusetts. The new rules follow the national code.

Following its successful suits against the Pennsylvania state law, the Pennsylvania Railroad has now restored passenger fares throughout its lines in that state to the basis of 2½ cents a mile, except on the Bedford division. This rate was restored on the main line in February, 1908; but on the Northern Central, the Allegheny Valley and the P., B. & W., the two-cent rate has been continued until now.

The shippers at Spokane, Wash., are not the only shippers who are dissatisfied with the rates proposed by the Interstate Commerce Commission in the transcontinental freight rate cases. The traffic bureau of the Salt Lake Commercial Club has also made a protest, which will be heard by the Interstate Commerce Commission September 6. It is contended that rates to Salt Lake should be made very much lower than those proposed by the commission. The bureau takes the rates made by the carriers to the Pacific coast as a basis and practically contends that the rates to Salt Lake should be no higher in proportion to distance.

Louis D. Brandeis of Boston has been engaged as counsel for the commercial organizations of eastern cities to represent the shippers in the freight rate inquiry, which the Interstate Commerce Commission will resume in New York on September 7. The cities represented in this combination of organizations are Boston, New York, Philadelphia, Baltimore and Richmond. D. O. Ives of Boston, chairman of the united organizations, is going to Spokane September 13 to present arguments at the hearing in that city when protests are to be made against the recent decision of the Interstate Commerce Commission in the Spokane freight rate case.

Reduction of Express Rates Ordered in Illinois.

The Illinois railway commission on August 27 issued an order requiring drastic reductions in express rates in that state. Its order is effective October 15. Chairman Berry issued the following statement regarding the order:

"Express tariff No. 1, promulgated to take effect Oct. 15, 1910, will establish a uniform scale of maximum rates on merchandise per 100 lbs., thus removing great inequalities in such rates.

"The commission's tariff provides for a maximum rate of 40 cents per 100 lbs. on merchandise for distances up to 30 miles, whereas, with a few exceptions, the express companies' minimum rate is 50 cents. The commission's tariff provides for maximum graduated charges on packages weighing less than 100 lbs. The commission's tariff does not provide a specific basis for making rates between points reached by one express company where two or more railways are used."

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JUNE, 1910.
(See also issues of August 5, 12, 19 and 26.)

Name of road.	Mileage operated; end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans-portation.	General.	Total.					
Arizona & New Mexico	108	$65,233	$5,978	$74,014	$4,345	$4,175	$674	$17,633	$1,877	$28,704	$45,310	.....	$7,637	$37,673	—$26,516
Atlanta & West Point	93	39,900	33,888	83,018	10,608	18,125	6,160	24,142	4,899	63,934	19,084	$187	8,165	11,106	—6,580
Belt Ry. Co. of Chicago	21	.....	.....	204,596	21,960	29,707	502	78,525	7,194	137,888	66,708	.....	5,000	61,708	—1,730
Birmingham Southern	36	49,164	1,326	58,271	12,250	14,989	214	23,985	1,750	53,188	5,083	.....	1,618	3,465	—6,622
Butte, Anaconda & Pacific	46	86,581	9,089	101,508	17,387	19,833	554	40,916	2,304	80,994	20,514	.....	2,000	18,514	—4,465
Chicago, Burlington & Quincy	9,040	4,494,172	1,977,613	7,100,473	1,571,867	958,039	145,033	2,517,032	182,573	5,374,544	1,725,929	—7,462	599,331	1,119,136	66,424
Chicago, Indianapolis & Louisville	616	349,413	123,107	522,151	68,493	76,268	18,418	186,876	18,546	368,601	153,550	.....	25,154	128,396	—74,736
Cleveland Terminal & Valley	84	79,581	15,486	118,750	17,680	10,842	1,867	46,414	1,882	78,685	40,065	.....	2,923	37,142	4,046
Colorado & Wyoming	55	38,391	3,248	81,948	6,979	16,196	342	22,064	1,879	47,460	34,488	.....	4,488	30,000	6,294
Cumberland & Pennsylvania	32	79,205	1,330	82,206	8,509	20,884	406	23,141	2,811	55,751	26,455	—5	2,877	23,573	9,133
Denver, Northwestern & Pacific	214	53,794	34,369	91,611	12,600	12,809	3,959	27,998	4,397	61,763	29,848	.....	3,000	26,848	11,281
Detroit & Toledo Shore Line	74	76,580	.....	76,939	6,758	2,169	1,189	20,517	1,856	32,489	44,450	.....	3,916	40,534	22,924
Eastern Ry. Co. of New Mexico	227	45,684	25,676	77,854	16,301	10,277	975	25,228	2,298	55,079	22,775	.....	7,638	15,138	—49,815
Fonda, Johnstown & Gloversville	84	21,374	52,875	79,290	4,327	4,315	636	19,384	4,642	33,304	45,986	—2,244	3,491	40,251	7,992
Fort Worth & Rio Grande	196	35,541	24,001	65,958	7,164	8,373	2,534	36,677	3,710	58,458	7,500	.....	2,994	4,506	—22,200
Indiana Harbor Belt	106	.....	.....	176,563	47,674	22,676	1,870	93,967	5,096	171,283	5,280	1,516	5,500	1,296	—10,207
International & Great Northern	1,159	432,076	163,850	643,427	122,130	94,614	18,452	352,128	22,442	609,796	33,630	—3,002	20,480	10,148	38,874
Lehigh & Hudson River	96	104,607	3,930	109,846	16,397	12,487	1,243	36,200	3,412	69,739	40,107	.....	7,238	32,869	—20,287
Lehigh & New England	170	89,557	989	91,392	50,931	10,250	1,018	20,173	3,393	85,764	5,627	.....	1,050	4,577	—26,883
Mississippi Central	164	53,321	15,722	74,992	17,304	10,330	1,046	15,749	3,833	48,262	26,730	.....	2,000	24,730	7,151
Mississippi River & Bonne Terre	64	54,755	8,306	68,413	12,397	8,780	1,087	21,637	4,534	48,435	19,978	.....	1,374	18,604	1,822
Missouri & North Arkansas	365	46,565	21,208	72,425	25,562	10,806	1,654	34,941	3,071	76,034	—3,609	.....	5,084	—8,693	—12,210
Monongahela	65	115,091	2,979	119,411	44,489	5,628	212	25,790	1,806	77,925	41,486	.....	8,346	33,140	—17,883
Monongahela Connecting	7	79,511	.....	83,758	12,338	13,796	300	42,944	2,501	71,879	11,879	.....	5,551	6,328	—14,541
Pecos & Northern Texas	225*	97,450	27,000	130,073	6,862	17,307	2,114	42,980	4,026	73,289	56,784	.....	8,501	48,282	—57,803
Peoria & Pekin Union	18	5,869	2,249	77,530	15,225	7,307	72	35,690	4,008	63,302	14,227	.....	3,800	10,427	—6,425
Quincy, Omaha & Kansas City	262	23,557	18,234	57,373	38,591	16,494	1,521	27,799	2,788	87,193	—29,820	.....	3,000	—32,820	—25,132
St. Louis, San Francisco & Texas	132	38,814	10,678	53,371	6,135	9,374	2,257	45,253	3,625	66,644	—13,272	.....	1,305	—14,577	—18,664
St. Louis Merchants' Bridge Terminal	9	.....	6,762	144,072	24,280	11,287	392	61,057	5,322	102,338	41,734	.....	14,517	27,217	12,147
South Buffalo	35	34,450	87	74,015	10,273	6,838	187	35,585	957	53,840	20,175	.....	800	19,375	—3,357
Southern Kansas Ry. of Texas	125	86,867	17,209	108,262	20,375	17,583	2,067	44,875	4,187	89,087	19,175	.....	7,846	11,329	—88,122
Syracuse, Binghamton & New York	81	44,588	30,149	85,598	6,833	6,293	3,609	27,252	2,028	46,015	39,583	.....	5,500	34,083	4,049
Terminal R.R. Ass'n of St. Louis	34†	.....	262	211,191	20,308	13,845	692	80,569	6,581	121,995	89,196	14,842	52,905	51,133	—10,070
Trinity & Brazos Valley	455	84,045	25,347	113,095	61,017	27,760	7,354	66,554	11,262	173,947	—60,852	.....	3,500	—64,352	10,146
Union R.R. Co. of Baltimore	9	106,947	20,074	128,759	13,383	.....	771	5,281	2,200	21,635	107,124	.....	10,903	96,221	11,676
Union R.R. Co. of Pittsburgh	31	.....	.....	415,331	56,111	60,758	7	117,283	3,547	237,706	177,625	7,497	2,770	182,352	—20,499
FISCAL YEAR ENDING JUNE 30, 1910.															
Arizona & New Mexico	108	$846,275	$83,033	$957,232	$120,623	$51,897	$2,784	$160,403	$20,816	$356,523	$600,709	.....	$29,217	$571,492	—$84,018
Atlanta & West Point	93	561,395	429,627	1,093,141	139,437	199,291	59,371	331,124	49,749	778,972	311,169	$860	55,809	256,220	93,686
Belt Ry. Co. of Chicago	21	.....	.....	2,102,651	183,272	302,930	6,817	977,458	76,041	1,546,518	556,133	.....	58,876	497,257	—257,410
Birmingham Southern	36	668,211	21,163	818,152	131,205	171,828	1,646	306,804	25,222	636,705	181,447	.....	19,165	162,282	60,386
Butte, Anaconda & Pacific	46	1,062,707	97,334	1,229,557	135,215	233,048	6,739	500,575	26,584	902,161	327,396	.....	24,918	302,478	—52,286
Chicago, Burlington & Quincy	9,040	58,224,537	22,380,305	87,869,517	15,725,461	15,057,165	1,654,452	28,340,052	2,233,835	63,010,965	24,858,552	—164,282	2,970,737	21,723,533	347,326
Chicago, Indianapolis & Louisville	616	4,063,422	1,449,074	6,020,241	792,968	822,785	175,641	1,973,814	182,927	3,948,135	2,072,106	.....	268,654	1,803,452	398,661
Cleveland Terminal & Valley	84	855,900	179,787	1,274,083	183,715	152,574	19,672	510,840	24,068	890,869	383,214	.....	40,357	342,857	62,421
Colorado & Wyoming	55	370,039	38,087	878,206	117,410	129,609	3,871	237,173	18,862	506,925	371,281	.....	18,157	353,124	47,426
Cumberland & Pennsylvania	32	857,107	17,243	894,633	64,246	251,844	5,220	255,004	33,916	610,230	284,403	366	32,480	252,289	84,911
Denver, Northwestern & Pacific	214	592,785	336,203	973,873	178,639	153,541	36,108	346,415	49,677	764,379	209,494	.....	31,500	177,994	110,798
Detroit & Toledo Shore Line	74	910,567	.....	913,624	114,183	54,853	14,126	255,298	21,291	459,752	453,872	.....	48,632	405,240	125,001
Eastern Ry. Co. of New Mexico	227	548,001	384,074	991,041	228,455	138,740	11,812	293,579	29,096	701,683	289,358	.....	47,955	241,403	—157,866
Fonda, Johnstown & Gloversville	84	247,363	603,318	904,751	80,990	49,284	7,268	227,926	56,054	421,522	483,229	—6,266	36,491	440,472	79,889
Fort Worth & Rio Grande	196	608,346	302,504	985,070	143,070	122,891	39,961	416,421	48,463	770,806	214,264	.....	22,689	191,575	—227,601
Indiana Harbor Belt	106	.....	.....	2,129,267	361,648	257,591	21,856	1,138,229	59,662	1,838,986	290,281	—1,099	55,459	233,723	131,600
International & Great Northern	1,159	6,092,218	1,933,488	8,566,865	1,438,106	1,386,878	229,287	3,736,170	259,346	7,049,787	1,517,078	—8,415	252,980	1,255,683	—2,866
Lehigh & Hudson River	96	1,378,531	44,266	1,440,633	186,097	152,314	14,155	492,641	44,194	889,401	550,632	.....	37,413	513,219	163,472
Lehigh & New England	170	871,474	12,997	894,324	163,324	109,693	12,581	239,601	36,766	561,965	332,359	.....	11,200	321,159	60,530
Mississippi Central	164	565,279	185,894	848,817	142,276	137,140	13,140	189,802	46,691	529,049	319,768	.....	17,600	302,168	91,830
Mississippi River & Bonne Terre	64	668,278	104,692	840,741	96,568	111,581	10,360	279,942	47,165	545,616	295,125	.....	14,135	280,990	97,104
Missouri & North Arkansas	365	520,082	251,670	826,711	256,273	119,637	18,356	317,396	34,109	745,771	80,940	.....	49,684	31,256	84,756
Monongahela	65	1,441,980	29,197	1,488,664	216,102	108,019	3,603	309,525	21,278	658,527	830,137	.....	21,346	808,791	295,429
Monongahela Connecting	7	897,915	.....	1,036,632	98,803	134,191	3,640	495,361	34,029	766,024	270,608	.....	27,429	243,179	116,401
Pecos & Northern Texas	225*	1,281,945	277,204	1,622,975	268,295	246,236	23,282	498,544	48,895	1,085,252	537,723	.....	30,476	507,247	—43,147
Peoria & Pekin Union	18	55,384	27,310	852,502	115,635	92,980	331	403,290	42,837	655,073	197,429	.....	44,800	152,629	—39,968
Quincy, Omaha & Kansas City	262	570,103	236,063	872,068	316,641	165,211	17,343	387,808	34,338	921,341	—49,273	.....	36,129	—85,402	—70,458
St. Louis, San Francisco & Texas	132	679,832	132,978	863,761	162,827	155,597	30,656	517,715	41,556	908,351	—44,590	.....	9,528	—54,118	—61,973
St. Louis Merchants' Bridge Terminal	9	.....	70,255	1,770,273	269,964	69,713	6,725	720,968	60,789	1,128,159	642,114	.....	91,967	550,147	159,937
South Buffalo	35	420,725	8,659	920,570	76,296	79,273	2,378	392,686	14,312	564,945	355,625	.....	10,442	345,182	226,718
Southern Kansas Ry. of Texas	125	1,301,519	230,449	1,576,229	195,378	285,566	23,653	534,071	46,439	1,085,107	491,122	.....	30,979	460,143	43,694
Syracuse, Binghamton & New York	81	531,110	364,500	1,023,419	50,368	73,256	37,005	322,908	27,832	511,369	512,050	.....	70,540	441,510	83,092
Terminal R.R. Ass'n of St. Louis	34†	.....	2,948	2,662,307	371,750	212,631	9,961	921,216	72,312	1,567,870	1,094,437	179,310	388,248	885,499	—105,513
Trinity & Brazos Valley	455	1,730,710	249,058	2,028,607	458,152	357,978	74,241	986,267	132,812	2,009,450	19,157	.....	42,853	—23,696	—34,188
Union R.R. Co. of Baltimore	9	1,219,408	232,986	1,472,166	142,836	.....	7,780	60,847	22,796	234,259	1,237,907	.....	60,022	1,177,885	237,077
Union R.R. Co. of Pittsburgh	31	.....	.....	4,056,447	423,114	641,645	1,222	1,339,443	40,527	2,445,951	1,610,496	56,259	37,152	1,629,603	720,800

*Mileage operated on June 30, 1909, 152 miles. †Mileage operated on June 30, 1909, 26 miles. — Indicates Deficits, Losses and Decreases.

Chicago Hearing on Proposed Increase in Freight Rates.

Examiners Brown and Hilliard began taking testimony at Chicago on Monday last in the proceedings involving the reasonableness of advances in freight rates to which the western lines are seeking the consent of the Interstate Commerce Commission. In opening the hearing Mr. Brown said that it would relate to the general question of whether the railways are entitled to make advances in rates and not to the question of the reasonableness of any of the specific advances which they propose to make. T. J. Norton, general attorney of the Atchison, Topeka & Santa Fe, said that the roads would first put in testimony tending to show the conditions on the individual roads which seem to their managements to justify advances and later to put in evidence relating to the general question of advances.

E. P. Ripley, president of the Atchison, Topeka & Santa Fe, was the first witness called by the railways. The following is an abstract of Mr. Ripley's testimony:

Railway rates should be raised for two reasons. First, because they are too low per se, as measured by any reasonable standard; and, second, because the railways need more money properly to develop their facilities. The commodity rates covered by the tariffs in question in these cases have been forced down to a point that is unreasonable, measured either by the value of the service to the shipper or the cost of the service to the carrier. The carriers as a whole have not had much control over rates. Carriers individually could have resisted reductions, but the competition of community with community, shipper with shipper and carrier with carrier has made effective resistance impossible. The railways have been particularly helpless to resist the demands for reductions of rates made by shippers controlling a large volume of traffic.

The Santa Fe has been perhaps reasonably prosperous compared with other roads, yet its net earnings in the past 15 years have been only 4.16 per cent. on its capitalization. Its earnings during the past ten years have been better than they were in the preceding ten years, yet in the last ten years they have equaled only 6 per cent. on its capitalization, and the capitalization does not equal the reproduction value of the property. The Santa Fe has earned as much as 13 per cent. in 12 months on its common stock, but this was in a year when it was extremely prosperous, and last year it earned on its common stock only 8.8 per cent. If it is to keep abreast of the times in the matter of improvements and maintain its credit, it must earn more than this. It is a little embarrassing to say that the road has not maintained its credit. Probably it has done as well as other roads, and yet it has had to sell its bonds for $8,000,000 less than their par value. There never has been a time when there have not been demands on it for expenditures which were two, three or four times as much as was available. It never has appropriated one-half as much money as the different department heads have desired to spend. The road ought not to have to sell its bonds at a discount. It ought to have earnings enough to encourage public confidence that its dividends will be maintained, so that instead of issuing bonds it could sell its stock at par. The Pennsylvania Railroad has not issued any bonds for years. When it wishes to make improvements it issues stock to pay for them. There are certain improvements which should be made from earnings rather than from capital. These include such improvements as elevation of tracks, the construction of expensive stations, etc. Every town along the line wants a good station. Improvements of this sort must be made in one of two ways; either from money raised by the sale of securities or from earnings. If they are made with money derived from the issuance of securities, the securities become a permanent charge on the property. It would seem that improvements of that sort ought to be paid by the present generation instead of being imposed as a burden on posterity. The railways of England have followed the practice of charging all improvements to capital and the consequence is that they have their capitalization so high that they can hardly earn a return on it. A railway should also earn enough in excess of its interest and dividends to provide against the obsolescence of the different parts of its property. Many railways are at the point where facilities which a few years ago were adequate to the demands of their traffic must now, or very soon, be replaced. The railways entering Kansas City, for example, are spending $20,000,000 on a passenger station and terminals there. The railways entering the Dearborn street station at Chicago must soon build a new station. The North Western is spending millions on a station at Chicago on which it never will be able to earn a return. The same thing is true of the Pennsylvania Railroad in New York. Within the next five or six years the railways ought to spend sixty or seventy millions in Chicago. Then the railways must be able to earn enough in years of prosperity to provide against the lean years. The reasonableness of its rates should not be judged entirely by the return which it can earn on them in the best years.

The advances in rates which are involved in this hearing really amount to very little. They would not bring to the Santa Fe enough money to do one-tenth of the things that it ought to do. On the other hand, the effect on consumers would be negligible. There is not a family in the United States that would see the difference in its expenses. It is doubtful if the advance in these rates would make a difference of a dollar a year in the expenses of any family in the country, for the freight rate does not affect the price of a great many commodities. Shoes, clothing, etc., are sold regardless of the freight rate. They bring the same price at the door of the factory in New York as they do in San Francisco.

The main standard of the reasonableness of the rate is the value of the service to the shipper—what has sometimes been called "what the traffic will bear," having regard to the freest possible movement of commodities and the imposition of the least possible burden on the producer and consumer. The middleman can take care of himself. In the application of this principle of charging no more than the traffic will bear, the railways have been making some rates which are much below the average cost of the service. The public is apt to think that because the railways can make some rates so abnormally low they ought to make all the rates equally low. But the railways are able to make some rates so low, not because they cover the total cost of the service, but because if those rates were not made low the freight would not move at all.

The railways have accomplished great economies in operation. They have rebuilt their tracks, enlarged their cars and engines, and improved their operating methods. But all these things have not enabled them adequately to increase their profits. Some of the improvements they have made have actually increased their expenses and reduced their profits. For example, in order to work the automatic coupler, cars have to be pushed together so very hard that a great deal of damage is done to freight by the rough movement. The loss and damage claims on the Santa Fe are $1,600,000 a year, and the great increase in them has been largely due to the use of the automatic coupler. One of the largest increases in our expenses has been the recent advances in wages. They already amount to $2,000,000 a year on the Santa Fe, and if we granted all the other demands on us they would amount to $2,500,000 more.

A railway, in order to maintain its credit and meet the reasonable demands of the public for good service ought to earn on its stock double the amount that it pays in dividends. For example, if it pays 6 per cent. dividends it should earn 12 per cent. on its stock, the extra 6 per cent. being used for improvements in the property which will earn no return. There is hardly a railway in this country that is built as it ought to be built. We do not like to depreciate our own property, but the best roads in this country west of the Allegheny mountains are very far short of what they ought to be to give the public the service it has a right to demand, or would have the right to demand if it paid for it.

The Santa Fe has put about $40,000,000 of earnings into the property in the last 15 years which has not been capitalized. Of this, the sum of 23 millions has been written off and has absolutely disappeared. In addition to that the sum of $3,000,000 has been received from land sales, which also has gone into the property and been written off. The $8,000,000 discount on the sales of our bonds has also been written off.

It is difficult to say what the limit of our economies is and it is difficult also to say what the limit of our expenses will be. There is danger of obsolescence in everything we own. We do not know when we shall have to throw away our locomotives and substitute electricity or some new power. We have practically 2,000 locomotives, representing an investment of $40,000,000, and the development of some new power might make it necessary for us to scrap all of them.

Examiner Brown: I recollect as you went along you stated

that about all of the western roads would have to be rebuilt. Does that mean that the life of a railway is about 50 years?

Mr. Ripley: Some of the western roads have been built longer than 50 years. They have been in constant course of rebuilding ever since they were built. The railway of 50 years ago would not carry anything now; it would not be considered equal to a contractor's plant for running gravel trains. The railways have been built and rebuilt several times.

Mr. Ripley referred to the great increases in the expenses of railway materials that have taken place. He said that theoretically the larger cars that have come into use reduce railway expenses, but practically in many cases they do not. It is doubtful whether it has been wise to increase the size of box cars beyond 80,000 lbs., because the practical unit of sales as to many items is the carload and there has been a great indisposition on the part of the shipping public to increasing the minimum carload; so, in many cases, the roads are obliged to use for a 15-ton load a car which will carry 40 tons. The Santa Fe's taxes are 100 per cent. heavier than they were 15 years ago. They were $250,000 more in the last fiscal year than in the preceding fiscal year, on account of the new corporation tax. The total increase in taxes for the year was over $400,000. Another item in the increase in expenses is the cost incurred by the road in being regulated by the 13 states and the national government under whose supervision we are. It costs the Santa Fe about $150,000 a year to be regulated.

The investment in the property of the Santa Fe in 1896 was $372,000,000, and at the close of 1910 it was practically $580,000,000. The income applicable to interest, dividends and improvements grew from $6,000,000 in 1897 to $32,000,000 in 1910. The percentage of income on investment in property grew from 1.57 per cent. in 1897 to 5.58 per cent. in 1910, and in no year has it exceeded 6.31 per cent., which figure it reached in 1907. Only twice in 15 years was 6 per cent. reached.

J. H. Atwood, counsel for some of the shippers, raised the question whether a reduction in the rates would not increase the traffic, and thereby increase the earnings, while advances in rates would have a tendency to reduce the amount of traffic. Mr. Ripley said that the rates on all commodities except the more bulky and less valuable are so low that a reduction in rates would not increase the movement in traffic. The rate on citrus fruit from California being specifically mentioned, he said it amounted to about six cents on a dozen oranges, and that if the rate were halved there would not be one orange or lemon more shipped, assuming, of course, that corresponding reductions in the rates on oranges were made from other sections.

Mr. Ripley said that the gross earnings of his road for the fiscal year, 1910, were about $10,200,000 greater than in the preceding year; while expenses increased about $12,000,000. He was questioned as to whether the increase in expenses was caused by charging to operation items that should have been charged to capital, and mention was made of $700,000 for relining a tunnel and $703,000 put into the fuel reserve fund. Mr. Ripley contended that all such items should be charged to operation. He explained that an increase of $500,000 in maintenance of way and structures was made necessary because not enough was spent for these purposes in 1909. Thus far in the present month (August) the gross earnings have fallen off $750,000 from the figures of last year. Items of expenses, which must be met in the coming year, warrant him in the belief that the net earnings will not more than pay the 6 per cent. dividend on the company's common stock.

James Peabody, statistician of the Santa Fe, presented a number of tables of figures relating to taxes, tonnage, damage to live stock, injury and damage to persons, wear and tear on cars and numerous other matters. Under the head of necessary expenses for the years 1911 and 1912 Mr. Peabody declared that the Santa Fe would require the expenditure of $66,500,000, the items of expense including: Track elevations, $3,500,000; second track, $15,627,314; new rails, $6,047,492; new stations, $4,685,174; terminal yards, $4,317,937; regrading, $5,473,639; ballast, $5,914,088, and various other improvements and betterments ranging from $1,000,000 to $3,000,000.

The Grievance of the "Tap Lines."

Lumbermen from Missouri, Texas, Louisiana and Arkansas met in St. Louis on August 25 and organized the Western Short Line Railroad Association. The lumbermen in question all own logging roads which are used exclusively for the transportation of lumber from the forests and the mills to connections with standard railways. Forty-two of these so-called tap line railways are represented in the association. The railways have heretofore given these lines divisions of the through rates. The ruling of the Interstate Commerce Commission that the payment of divisions to any road which is not a common carrier is illegal, caused the principal railways in the Southwest to announce that they would cancel these divisions at various dates in September. The purpose of the Western Short Line Railroad Association is to take up with the Interstate Commerce Commission and the railways the question involved and see if some arrangement cannot be made under which they can continue to get their divisions. It is announced also that "the tap line and lumber interests will conduct a campaign of publicity, and the public will be educated in the matter of freight rates."

There are indications that the lumbermen will not take a unanimous stand regarding the matter. G. F. Thomas, traffic manager of the Arkansas Lumber Manufacturers' Association, while attending a meeting of the Stave Manufacturers' Association in Chicago on August 23, said flatly that a thousand large lumber mills in the South and Southwest have been getting rebates from the railways in the form of divisions of the through rate. He said: "The methods used are simple. Each big mill owner builds a short railway from his mill to the nearest point on a trunk line. The only purpose of this road is to haul the company's lumber out of the woods, although sometimes it carries a small amount of freight. The owners of the mill organize the road as a separate corporation and then make an agreement with the trunk line whereby the same rate is quoted from the company's mill to Chicago or some other market as is made from the junction point. The trunk line divides the profit with the mill; or, ostensibly, with the short lumber line. The mill by this means gets a rebate of from 1 to 4 and even 6 cents per thousand feet of lumber shipped."

It seems probable that the lumber concerns which do not own small railways, and, therefore, do not benefit by this practice, will send representatives to Washington to commend the action of the commission in abolishing it.

The Freiro Valley Railroad Company, a tap line in Arkansas, has brought suit in the federal court of the western district of that state to restrain the Chicago, Rock Island & Pacific from canceling the through rates it has made in connection with this tap line. Judge Rogers heard arguments in the case and took it under advisement.

Iowa Commission Condemns Rigid Distance Tariff.

The Iowa Railway Commission in its annual report which has just been filed with the Governor recommends the adoption of legislation to enable the commission to make the intrastate rates in Iowa more flexible. The views expressed by the commission are a virtual admission that the distance rate theory, which has been applied by the legislature of that state in a more thoroughgoing manner than by the legislature of any other state in the country, has broken down. The commission says in part:

"The first principle which ought to be applied by an Iowa rate-making body, and which ought to be and which always has been in the mind of this commission in every rate adjustment, is that every Iowa industry should be protected to the utmost limit of the power of this board. The commission believes that if the doctrine of protecting home industry is good for the nation it is good for the state. Every manufacturing interest in Iowa should be fostered and encouraged, and Iowa shippers should not be placed, in any respect whatsoever, to any disadvantage as compared with a shipper who lives outside the state. If this principle is correct, and we believe it is, this board should use its power and its influence in building up home industries to the end that the raw material produced in Iowa should be manufactured at home, thus giving employment to Iowa labor and investment for Iowa capital.

"It is the opinion of this board that if the rigidity of the Iowa distance tariff could be lessened to some extent and it were given flexibility at the discretion of the board, in many instances industries could be fostered in this state which would tend greatly to upbuild without any injury whatever to those which already exist or to the people of Iowa."

Referring to the long and short haul section of the Iowa law, which has been rigorously enforced, the commission says:

"The legislature has made some attempts to so amend this section of the law as to enable this board to permit the making of rates by carriers which are prohibited by the section under such conditions as to prevent any unjust discrimination. Owing to the peculiar situation of Iowa in the general rate structures of the country, many conditions arise which demand an adjustment of rates within the state to meet conditions over which the state authorities have no control. Where these adjustments can be made without disturbing the general rate structure within Iowa, the board, after investigation, should have authority to permit the railway companies to do so. It is probable that sections 2145 et seq. would have to be considered in any such amended statute, but the commissioners believe this could be taken care of without detriment to carriers and certainly to the advantage of the shipping public in Iowa. The board respectfully suggests that this should be considered by the next general assembly."

INTERSTATE COMMERCE COMMISSION.

William J. Meyers, statistician for the New York Public Service Commission, Second District, has been appointed statistician in the office of the Interstate Commerce Commission at Washington.

STATE COMMISSIONS.

John J. Murray has been appointed Traffic Inspector for the New York State Public Service Commission, Second District, succeeding George V. Horgan. Mr. Murray was in the service of the Erie Railroad for 12 years and for the last nine years has been an inspector of freight, for classification purposes, of the Trunk Line Association.

The Texas railway commission has issued an order revoking an order which had been made by it prohibiting the railways from advancing charges to shippers. The commission revoked its former order because the attorney-general gave a ruling holding that there is no statute which prohibits the railways from doing this, provided they extend the privilege to all shippers alike.

W. C. Wishart has been appointed chief of the Division of Statistics and Accounts, New York State Public Service Commission, Second District, Albany, N. Y., succeeding William J. Meyers, who has resigned to go to Washington. Mr. Wishart was formerly assistant secretary of the Corporation Commission of North Carolina, and for two years past has been an examiner the Interstate Commerce Commission.

A petition sent this week to the Interstate Commerce Commission asking for a general investigation of the rates of all the principal express companies, because of their excessive and extortionate rates, is signed by 124 boards of trade and other commercial organizations. The Merchants' Association of New York, the Boston Chamber of Commerce and similar bodies in San Francisco, New Orleans, Philadelphia and Baltimore are among the leading signers. The majority appear to be from eastern cities.

The New York Public Service Commission, Second district, has appointed Carl E. Pelz, of 244 Warburton avenue, Yonkers, civil engineer of grade crossings to supervise the work on behalf of the state for the elimination of grade crossings of the New York Central & Hudson River Railroad in the so-called electric zone in the county of Westchester. The compensation has been fixed at $2,400 a year. The commission has appointed John W. Andrews, at present a factory inspector in the employ of the State Labor Department, as assistant inspector of electric railways at a salary of $1,500 a year.

The Amaga Railway of Colombia, which is to connect Medellin with the Cauca river, is reported to be under active construction. The property belongs to a Colombian company, capitalized at $1,000,000, and during 1910 the company expects to place orders for 1,000 tons of rail of the Vignole type.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Lewis Neilson, secretary of the Pennsylvania Railroad, has been appointed also secretary of the Northern Central and various other subsidiary companies of the Pennsylvania Railroad, as previously announced in these columns. Mr. Neilson was born at Florence, N. J., on September 30, 1860, and entered the Academy of the Protestant Episcopal Church in 1870 and the University of Pennsylvania in June, 1877, from the college department of which he was graduated in June, 1881. He entered the service of the Pennsylvania Railroad in June, 1881, as weighing clerk, and was soon made assistant receiving clerk. He filled various positions in the cashier's department and the following year was promoted to stenographer. His next position was in the office of Captain Jno. P. Green, then fourth vice-president, as stenographer. In December, 1885, he was promoted to chief clerk in that office, and two years later he was appointed chief clerk to the secretary, and then for about one year he was assistant secretary *pro tem.* in addition to performing the duties as chief clerk. He was then appointed assistant secretary of The Pennsylvania Railroad and the Philadelphia, Wilmington & Baltimore. In June, 1898, he was appointed to the same position on the Philadelphia & Baltimore Central. Mr. Neilson was elected secretary of the Pennsylvania Railroad and of the Philadelphia, Wilmington & Baltimore in January, 1901, to fill the vacancy caused by the death of John C. Sims. He succeeded Mr. Sims also as secretary of the Philadelphia & Baltimore Central and the Junction Railroad companies. He became the superintendent of the Employees' Savings Fund on June 1, 1906.

Lewis Neilson.

L. L. Scherer, general claim agent of the Chesapeake & Ohio at Richmond, Va., has had his authority extended over the Chesapeake & Ohio of Indiana.

W. R. Alderger, traffic manager of the Tonopah & Tidewater at Los Angeles, Cal., has been elected also a director and vice-president of the Oakland Traction Co.

Operating Officers.

J. W. Roberts, assistant car accountant of the Vandalia, has been appointed car accountant, with office at Terre Haute, Ind., succeeding H. G. Sleight, retired.

F. E. Miller, superintendent of dining service of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has resigned to engage in private business.

John Matthews has been appointed telegraph manager of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., succeeding W. M. Knowd, assigned to other service.

The office of J. A. McCrea, general superintendent of the Long Island Railroad has been transfered from Long Island City to the new Pennsylvania Station, Eighth avenue, New York City.

J. M. Scott, until two months ago a division superintendent of the Cincinnati, Hamilton & Dayton, has been appointed a trainmaster of the Kansas City Southern, with office at Mena, Ark.

J. P. Lathrop has been appointed an assistant superintendent

of the St. Louis & San Francisco, with office at Francis, Okla., succeeding J. F. Hickey, resigned to accept service with the Missouri, Kansas & Texas.

John S. May has been appointed superintendent of the Buffalo & Susquehanna Railroad and the Buffalo & Susquehanna Railway, in charge of maintenance of way and structures and of transportation, with office at Galeton, Pa.

C. C. Riley, superintendent of transportation of the Kansas City Southern at Kansas City, Mo., has been appointed general superintendent in charge of transportation, with office at Kansas City, and the position of superintendent of transportation has been abolished.

F. L. Fay having resigned as car accountant of the Bessemer & Lake Erie, to go into other business, the position has been abolished. All communications heretofore addressed to the car accountant should in future be addressed to J. S. Matson, superintendent, Greenville, Pa.

The following officers of the Chesapeake & Ohio have had their authority extended over the Chesapeake & Ohio of Indiana: C. C. Walker, general superintendent transportation; J. S. Stevens, superintendent telegraph, and G. S. Sipp, car service agent, all with offices at Richmond, Va.

Traffic Officers.

H. S. Waggaman has been appointed a traveling freight agent of the Houston East & West Texas, with office at Houston, Tex.

Charles D. Simonson has been appointed special agent, freight department, of the Rock Island Lines, with office at New York.

W. P. Overbay, traveling passenger agent of the Missouri, Kansas & Texas at Chicago, has been transferred to Detroit, Mich.

J. T. McKenney, city passenger agent of the Northern Pacific at Duluth, Minn., has been appointed a district passenger agent, with office at St. Paul, Minn.

A. L. Crow, city passenger and ticket agent of the Missouri, Kansas & Texas of Texas at Galveston, Tex., has been appointed a district passenger agent of the Missouri, Kansas & Texas, with office at Chattanooga, Tenn.

A. B. Burke has been appointed a traveling passenger agent of the Canadian Pacific, with office at Boston, Mass., and N. R. Des Bresay has been appointed a traveling passenger agent, with office at St. John, N. B.

Eduardo Castro has been appointed general agent in the traffic department of the National Railways of Mexico, with office at Mexico City, succeeding G. R. Hackley, resigned to accept service with the St. Louis & San Francisco.

J. J. McCormick, district freight solicitor of the Union line of the Pennsylvania Lines West at Wheeling W. Va., has been appointed agent at Cleveland, Ohio, succeeding H. E. Prindle, retired. C. D. Howe succeeds Mr. McCormick.

Phil K. Gordon, Pacific coast passenger agent of the Southern Railway at San Francisco, Cal., has been appointed general agent in the passenger department of the Galveston, Harrisburg & San Antonio, with office at San Francisco. He will represent also the Southern Pacific lines in Louisiana.

Guy S. Harner has been appointed district passenger agent of the New York Central & Hudson River, the Boston & Albany and the West Shore at Springfield, Mass., and J. E. Sweeney, city passenger agent at Worcester, Mass., has been made district passenger agent at Worcester. F. G. Chapin succeeds Mr. Sweeney as city passenger agent.

Benjamin L. Bugg, who has been appointed traffic manager of the Norfolk Southern, with office at Norfolk, Va., was born in 1869 at Palo Alto, Miss. He received a high school education and began railway work as a telegraph operator in 1887 on the Florida Railway & Navigation Co., which was reorganized as the Florida Central & Peninsular in 1890, and is now a part of the Seaboard Air Line. In 1891 he went to the Georgia Southern & Florida, and about four years later left that company to go to the Central of Georgia. He was appointed general agent of the Old Dominion Steamship Co. at Norfolk, Va., in 1907, which position he held at the time of his recent appointment as traffic manager of the Norfolk Southern.

Andrew L. Ellett, general western passenger agent of the Chesapeake & Ohio at Cincinnati, Ohio, has been appointed an assistant general passenger agent of that road and the Chesapeake & Ohio of Indiana, with office at Cincinnati. The following officers of the Chesapeake & Ohio have had their jurisdiction extended over the C. & O. of Indiana: H. W. Fuller, passenger traffic manager, with office at Washington, D. C.; Thornton Lewis, general western freight agent of the C. & O. and manager of the Kanawha Despatch at Cincinnati; W. F. Hite, assistant general freight agent at Huntington, W. Va., and W. D. Upshur, assistant general freight agent at Richmond, Va.; W. L. Divine, general import freight agent, O. N. Seely, commercial agent, and O. N. Spain, traveling passenger agent at Cincinnati; S. G. Beckley, general eastern agent of the Kanawha Despatch at New York; W. S. Bronson, assistant general passenger agent at Richmond, and H. S. Calcutt, superintendent of dining cars at Covington, Ky.

L. F. Vosburgh, assistant general passenger agent of the New York Central & Hudson River, the West Shore and the Boston & Albany, at New York, has been appointed general passenger agent, with office at New York, succeeding Gerrit Fort, whose resignation has already been announced in these columns. Mr. Vosburgh began railway work in 1893 as assistant night ticket agent of the Lake Shore & Michigan Southern, and two years later he was promoted to assistant ticket agent at the La Salle street station, Chicago. He was appointed city passenger agent of the Lake Shore & Michigan Southern in 1897, and in 1903 was promoted to general western passenger agent (Chicago). Three years later he was made general eastern passenger agent of the New York Central Lines (New York), and on February 1, 1910, he was promoted to assistant general passenger agent, which position he held at the time of his recent appointment as general passenger agent.

L. F. Vosburgh.

Engineering and Rolling Stock Officers.

E. F. Tegtmeyer has been appointed master mechanic of the Nebraska and Colorado divisions of the Rock Island Lines, with office at Goodland, Kan., succeeding D. H. Speakman, resigned.

G. W. Russell, master mechanic of the New York, Philadelphia & Norfolk at Cape Charles City, Va., has been appointed general equipment inspector, reporting to the superintendent. J. L. Cunningham succeeds Mr. Russell, both with offices at Cape Charles City.

F. H. Alfred, formerly assistant to the president in charge of the engineering department of the Cincinnati, Hamilton & Dayton, whose appointment as general superintendent has been announced in these columns, will continue in charge of engineering matters.

The New York, Philadelphia & Norfolk has been divided into two supervisor's divisions. E. C. Young has been appointed supervisor of division A, with office at Cape Charles, Va., and U. F. White has been appointed supervisor of division B, with office at Salisbury, Md.

The following officers of the Chesapeake & Ohio have had their authority extended over the Chesapeake & Ohio of Indiana: J. F. Walsh, general superintendent motive power; T. M. Ramsdell, master car builder; Charles Stephens, signal engineer, and

J. M. Staten, general inspector of bridges, all with offices at Richmond, Va.

Charles E. Brinser, whose appointment as division engineer of the New York, Philadelphia & Norfolk, with office at Cape Charles, Va., has been announced in these columns, was born on December 3, 1881, at Elizabethtown, Pa. Mr. Brinser was educated in the high school of his native town and at Franklin and Marshall academy. He began railway work on April 9, 1900, as a rodman on the Pennsylvania Railroad, remaining in the construction department for about two years, when he was appointed rodman in the maintenance of way department at Philadelphia. He was appointed transitman in March, 1903, and from September of the same year until April, 1907, he was assistant supervisor of the Amboy division, the Monongahela division and the Philadelphia division. He was appointed supervisor of the Delaware division of the Philadelphia, Baltimore & Washington in April, 1907, which position he held at the time of his recent appointment as division engineer of the New York, Philadelphia & Norfolk.

Purchasing Officers.

F. S. Wynn, assistant secretary of the Southern Railway at Washington, D. C., has been appointed purchasing agent, with office at Washington. Mr. Wynn will report to H. B. Spencer, vice-president.

B. T. Jellison, purchasing agent, and R. L. Morris, general storekeeper, of the Chesapeake & Ohio, have had their authority extended over the Chesapeake & Ohio of Indiana, both with offices at Richmond, Va.

OBITUARY.

Percy F. Gaines, since 1906 general freight agent of the Pere Marquette, with office at Detroit, Mich., died in Detroit on August 21.

William P. Jenkins, formerly general freight agent of the Delaware, Lackawanna & Western and later traffic manager of the Northern Indiana until that road was discontinued in 1906, died in Chicago on August 23.

John J. McVean, member of the American Society of Civil Engineers, and formerly for many years chief engineer of the Chicago & West Michigan and the Detroit, Grand Rapids & Western, now a part of the Pere Marquette, died on August 21 at his home in Grand Rapids, Mich.

Charles Talbot Porter, honorary member of the American Society of Mechanical Engineers, died on August 28 at his home in Montclair, N. J., at the age of 81. Mr. Porter was awarded the John Fritz medal last year for his work in advancing the knowledge of steam engineering and in improvements in engine construction. He was the first to recognize the advantages to be derived from making a crank shaft turn at a high number of revolutions whereby the weight of the motor per horse-power is reduced. It is from the development of this thought that we have the modern design of motor for self-propelled vehicles and for the aeroplane. Mr. Porter was born in 1829 and has been out of active business since 1890. In 1867 he installed the only high-speed engine exhibited at the French exhibition.

FOREIGN RAILWAY NOTES.

All railways operating in Costa Rica, whether organized abroad or not, are considered Costa Rican companies, and are subject to all the provisions of the new railway law.

The railway from Arica, Chili, to La Paz, 250 miles, is now being built by an English firm of contractors, who have about 2,000 men at work near Arica. Rails have been laid on 4[illegible] miles of line, and grading has been done on about 25 miles additional.

A general transportation law has been enacted by the Congress of Costa Rica. The law regulates the transportation of passengers and freight on land and sea, specifies the form of bills of lading, defines obligations and rights of shippers and consignees, and prescribes detailed rules for the transportation of live animals and perishable produce.

Railway Construction.

New Incorporations, Surveys, Etc.

ALBERTA & GREAT WATERWAYS.—According to press reports, plans have been made to start construction work at once on this line. The plans call for a line from Edmonton, Alb., north to Fort McMurray, on the Athabasca river, with a number of branch lines, in all about 350 miles. W. R. Clarke, president; J. A. L. Waddell, chief engineer, Kansas City, Mo. (Aug. 12, p. 294.)

BALTIMORE & OHIO.—This company has decided to put in a sixty car siding at Seymour, Ind.

BUFFALO & NORTHERN.—An officer writes that this company has completed its organization, with headquarters at Buffalo, Harper county, Okla. Surveys are being made from Buffalo east via Palace, Charleston, Saltfork, Fairvalley and Haskew to Avard, 60 miles. About half the survey is finished and grading contracts will probably be let in 60 or 90 days. There will be a large bridge over the Cimmeron river and a few small trestles. E. M. Best, president; F. C. Platt, secretary, Buffalo, and E. Tilleux, chief engineer, Hutchinson, Kan. (Aug. 26, p. 372.)

BUFFALO, ROCHESTER & EASTERN.—The New York State Public Service Commission will hold a hearing at Albany, September 21 and 22, to further consider the application of this road for a certificate of necessity for the construction of its proposed line from Buffalo, N. Y., to Troy, paralleling the New York Central. It is expected that the New York Central, the Delaware & Hudson and other companies will present statements controverting the assertions of the promoters of the B., R. & E. that the lines now serving this territory do not afford prompt and efficient service.

CANADIAN PACIFIC.—This company has opened for operation an extension from Shawinigan Falls, Ont., to Grand Mere, 5.35 miles.

CAPE CHARLES RAILROAD.—See New York, Philadelphia & Norfolk.

CHATTANOOGA SOUTHERN.—An officer writes that as soon as the line is located and right-of-way secured, a connecting line is to be built to the Rome & Northern Railroad from a point at or near Harrisburg, Ga., on the Chattanooga Southern, to Trion. It is understood that the Rome & Northern is to build from Gore to Trion, and that connection will eventually be made with the Seaboard Air Line to provide a new short route between Chattanooga, Tenn., and Atlanta, Ga. (Aug. 26, p. 372.)

CHERRYVALE, OKLAHOMA & TEXAS.—An officer writes that a contract has been given to the Continental Construction Co., Caney, Kan., to build a section of this line from Caney, southeast via Wann, Okla., Delaware, Nowata and Vinita to Silver Springs, Ark., thence south to Fayetteville, about 150 miles. The work will be light. The line will have 1 per cent. grades, with 6 degs. of curvature. There will be three steel bridges. Grading has been finished on 10 miles. S. M. Porter, president, Caney; B. J. Dalton, chief engineer, Lawrence. (April 15, p. 1015.)

CHICAGO, AURORA & DE KALB.—This company has begun the electrical operation of its line from Aurora, Ill., west to De Kalb, 31 miles. This was formerly a steam line. The work of electrifying the road was carried out by the company with its own forces. (March 18, p. 749.)

CHICAGO GREAT WESTERN.—According to press reports, this company will build a 24-mile cut-off from Mason City, Iowa, northeast to Osage. The line will connect the Dubuque & Minneapolis division with the Hayfield & Council Bluffs route.

CLEVELAND SHORT LINE.—An officer writes that contracts are about all let for building this belt line around Cleveland, Ohio, from a point near West Park, seven miles west of Cleveland, east, thence northeast to Collinwood, 19.05 miles. The line is in operation from the western terminus east to the southeastern section of Cleveland on 9.68 miles. A section of the line from this point passes through southeast Cleveland under the main streets, also under the tracks of the Pennsylvania Lines, the Erie and the

Wheeling & Lake Erie, through double-track tunnels, 40 ft. below the surface. The work is heavy and includes grade separation of 32 highways and streets. The contractors are the Robert Grace Contracting Co., J. C. Carland & Co. and H. E. Culbertson & Co., all of Cleveland. The line will furnish interchange facilities between all railways entering Cleveland. Work was started in May, 1906.

Clinton & Oklahoma Western.—This company, which operates a line from Clinton, Okla., to Butler, 21.5 miles, is said to have secured $750,000, to be used for building an extension westward into the Texas panhandle. The proposed route is up the Washita river to Gem City, thence via Cheyenne, Okla., to Canadian, Tex.

Coeur d'Alene & Pend d'Oreille.—An officer writes that work is now under way by the company's men building an extension from the main line of the Spokane International at a point 25.5 miles from Spokane to Coeur d'Alene, Idaho; also a line from Corbin, on the Spokane International. Track has been laid on 7.9 miles on the Coeur d'Alene branch. Maximum grades will be 1.4 miles and maximum curvature 10 degs.

Columbus, Urbana & Western Electric.—Arrangements are said to be made to begin construction work on an extension from Fishingers, Ohio, north to Dublin, about 10 miles, as soon as the right-of-way has been secured. Material has been arranged for, and the work will be pushed to completion.

Danville & Western.—An officer writes that surveys have been made for an extension from Leaksville, N. C., southwest to Madison, 12 miles. The company has not yet decided to build the extension.

Denver, Laramie & Northwestern.—This company, operating a line from Denver, Colo., north to Greeley, 56 miles, has projected extensions aggregating about 200 miles. It is understood that the company will continue the extension to the Elk Mountain coal fields of Wyoming, 216 miles from Denver. There are two general plans under consideration for building extensions west beyond Elk Mountain.

Duluth, Winnipeg & Pacific.—An officer writes that contracts for putting up steel bridges were to be let September 1, and additional contracts are to be let about September 15. The company is building from Duluth, Minn., north to Virginia, 74.4 miles. Foley, Welch & Stewart, St. Paul, Minn., are the general contractors. There will be 12 steel bridges aggregating 1,750 ft., eight trestles and one 500-ft. tunnel. In addition there will be one 30-ft. stone arch and another of 45 ft., also a roundhouse, and car and locomotive repair shops. The principal revenue of the line will be derived from carrying ore and lumber. (Feb. 25, p. 429.)

Frederick Railroad.—An officer writes that contracts have been let for building an extension of one mile in Frederick, Md. The work includes two 25-ft. span bridges of I-beam construction. The company plans to electrify the line from Frederick to Thurmont, 17 miles.

Grants Pass & Western.—Incorporated in Oregon, with $500,000 capital by the Harriman interests, to build from Grants Pass, in southern Oregon, southwest to Crescent City, in Del Norte county, Cal., 70 miles. The incorporators include J. P. O'Brien, Portland, Ore.; C. G. Sutherland and J. G. Wilson.

Gulf & Magnolia Northern.—An officer writes that contracts will probably be let during the next 90 days for building an extension from Hope, Ark., west via Columbus to Horatio, 55 miles. This extension is eventually to be continued from Horatio northwest to Haleyville, Okla. Contracts are to be let about the same time for an extension from Magnolia, Ark., southeast to Junction City, 37 miles. The plans call for a further extension of this line to Monroe, La. The work will average about 25,000 cu. yds. a mile. (Aug. 26, p. 372.)

Halifax & Eastern.—This is the new name of the Nova Scotia Eastern, which was organized to build about 235 miles through the central district of Nova Scotia, opening up and uniting several industrial centers and joining them to the New Glasgow and the Pictou coal fields. The line is to connect the Intercolonial Railway on the north with the deepwater harbor, called Country Harbor, on the south, also with Dartmouth harbor near Halifax on the west and the straits of Canso on the east. Construction work is to be started by September 1, and the entire line finished and in operation within three years. If the company fails to carry out this program it will forfeit the Canadian Government subsidy of $6,400 a mile. The original directors included J. R. Stratton, Peterboro, and J. W. Grier, Montreal.

International & Great Northern.—This company has under consideration the question of building a branch from Cotulla, Tex., southeast to Corpus Christi, about 125 miles. It is said that the plans for constructing the line are as yet only tentative, and that no definite action will be taken until after the road passes from its present receivership and is reorganized on a sound basis.

Louisiana & Arkansas.—An officer writes that an extension is to be built from Jena, La., to Jonesville, 25 miles. A further extension will eventually be built to Natchez, Miss., about 25 miles.

McPherson, Wichita & Arkansas.—See Midland Valley.

Midland Valley.—Under the name of the McPherson, Wichita & Arkansas, final surveys have been made, it is said, to build an extension of the Midland Valley from Arkansas City, Kan., northwest to McPherson, 120 miles.

Minneapolis, St. Paul & Sault Ste. Marie.—According to press reports, this company has been granted a certificate permitting it to build a line in Superior, Wis., from its present terminal to the ore docks. Permission was also granted to build the Tomahawk Bay route, an extension of the line to the proposed plant of the United States Steel Corporation.

Missouri, Oklahoma & Gulf.—Track laying has been started on the remaining section of eight miles south of the Red river in Texas to complete the line to Denison. The grading has been finished and it is expected to have the line in operation early in September. (Aug. 5, p. 263.)

New York, Philadelphia & Norfolk.—An officer writes that this company is building a short branch at Cape Charles, Va., under the name of the Cape Charles Railroad, extending from Bender's connection, where it leaves the main line of the N. Y., P. & N., to Townsend cross road, 6¼ miles.

Nova Scotia Eastern.—See Halifax & Eastern.

Oregon Roads.—Plans are being made, it is said, by A. Lovegren, Preston, Wash., to build a line from the Oregon Electric Railway, at Forest Grove, Ore., to the Patton valley district.

Oregon Trunk Railway.—This company has filed amended articles of incorporation in Washington, which show that the lines to be built are as follows: From a connection with the Spokane, Portland & Seattle, opposite a point near Celilo, Ore., south along the Des Chutes river to Klamath Falls; also from a point in township 35 south, range 7 east, in Klamath county, west to the city of Medford, 70 miles. A branch is also to be built from a point in section 9, township 18 south, range 12 east, southeasterly through Crook county to a point in township 26 south, range 33 east, in Harney county, 155 miles. The company is also permitted to build other branch lines and extensions. (Aug. 12, p. 297.)

Osage Western.—According to press reports, work has been started at Billings, in Noble county, Okla., eastward through Fairfax, towards Pawhuska and Bartlesville. The company was organized to build from Enid, Okla., east to Vinita, 178 miles. R. H. Hoss, president, Fairfax, and E. J. Noonan, locating engineer, Muskogee. (April 1, p. 918.)

Pensacola, Mobile & New Orleans.—An officer writes that all the contracts have been let for building from Pensacola, Fla., northwest to Mobile, Ala., 60 miles. Grading has been finished on 30 miles. Henry McLaughlin, Pensacola, has a grading contract for work on a section of 10 miles, and C. W. Merritt, Pensacola, is said to have a grading contract for work from Loxley, Ala., to Mobile Bay. E. McLaughlin, president, and L. G. Wilkinson, superintendent of construction, Pensacola. (July 29, p. 206.)

Temple Northwestern.—An officer is quoted as saying that track laying is to be started and grading work will be pushed on the first section from Temple, Tex., northwest to Gatesville. Work was started early this year by D. J. Grigsby, Temple. The plans call for a line from Temple northwest to Benjamin, in Knox county, about 210 miles, air line. W. J. McDaniel, president, and W. E. Dozier, chief engineer, Temple. (April 29, p. 1115.)

Railway Financial News.

BEAUMONT & GREAT NORTHERN.—It was announced last week in Houston, Tex., after a meeting of the stockholders of this road, that the whole of the stock and bonds of the company had been sold by J. M. West and R. C. Duff to William Carlisle, of Atchison, Kan., former owner of the road. The road extends from Trinity, Tex., southeast, 34 miles, to Livingston, on the Houston, East & West Texas. It has three locomotives, two passenger cars and 74 freight cars. It is said that the sale of the road has been hastened by the expectation that, in consequence of the decision of the Interstate Commerce Commission concerning allowances to short lines on lumber shipments, the revenues on this line would be reduced, unless the ownership of the property were transferred to parties not interested in property shipped. The regular annual meeting of the stockholders, which had been postponed until August 26, resulted in the election of officers for the ensuing year as follows: William Carlisle, Atchison, Kan.; J. M. West, Houston, Tex.; James W. Orr, Atchison, Kan.; C. J. Rogan, Onalaska, Tex.; Leroy Trice, Kyle, Tex.; R. C. Duff, Houston, Tex.; S. E. Barnes, Trinity, Tex.; J. L. Thompson, Houston, Tex.; Thomas Waties, Houston, Tex. At the meeting of the board of directors the following officers were elected: William Carlisle, president; J. M. West, vice-president; S. G. Guerrier, assistant to president and assistant secretary; G. W. Pennell, vice-president; C. J. Rogan, vice-president and general superintendent; James W. Orr, general counsel; W. S. Bartlett, secretary and treasurer.

BUFFALO & SUSQUEHANNA.—The receiver of the road is doing everything in his power to better the condition of the properties. It is believed that before the road can be a really paying proposition much must be done in the elimination of curves and the reduction of grades. In order to bring about these needed improvements there must be further retrenchment on the part of the management. The problem of equipment is another the management is obliged to face. The future of the property remains still a problem. The properties must prove their earning power before the question of a sale can be seriously considered.—*Wall Street Journal.*

BUFFALO, ROCHESTER & PITTSBURG.—The New York State Public Service Commission, Second district, has authorized this company to buy the stock of the Silver Lake Railway, 1,200 shares, par value $100, and to issue consolidated 4½ per cent. bonds to the amount of $120,000 in exchange. The B., R. & P. is required to purchase the whole of the stock or none. The Silver Lake is an extension of the Silver Springs branch of the B., R. & P. It is seven miles long, from Silver Springs to Perry.

CHICAGO & MILWAUKEE ELECTRIC.—The following committee has been organized to prepare a financial plan: Andrew Crooke, chairman; George M. Reynolds, Frank A. Vanderlip, John M. Gibson and E. B. Osler.

CHICAGO, INDIANAPOLIS & LOUISVILLE.—The New York Stock Exchange has listed $3,000,000 refunding mortgage 4 per cent. bonds recently sold. These bonds are part of $5,300,000 refunding mortgage 4 per cent. bonds authorized by a supplemental mortgage of April 1, 1910, in lieu of $5,300,000 5 per cent. refunding bonds reserved under the mortgage of April 1, 1897.

DETROIT, TOLEDO & IRONTON.—The bondholders' protective committee, of which Alvin Krech is chairman, has published a notice to bondholders in which it says: "In the event of the deposit with the Young committee of any of the notes of the railway issued for Ann Arbor stock in accordance with the terms of the Young deposit agreement, it would be the duty of that committee to enforce the validity of all collateral pledged as security therefor; and as the $5,000,000 bonds [the legality of which bonds is now being tested in the court] constitute part of this collateral, it manifestly will be the duty of said committee to enforce the validity thereof." The committee, of which J. A. Young is chairman, has published a statement in which it says: "All of the $5,000,000 bonds referred to are held by the United States Mortgage & Trust Co. as part collateral for a series of notes of the Railway company. The validity of the issue of bonds has been on trial in a suit in the United States Supreme Court at Detroit and is now awaiting the decision of the court. None of these bonds has been deposited with the reorganization committee, and no disposition can be made of them until their validity has been established. The reorganization committee has not taken, and does not contemplate taking, any action to enforce their validity."

GREAT NORTHERN.—Clark, Dodge & Co., White, Weld & Co. and Blodget & Co., all of New York, are offering $2,916,000 Great Northern-St. Paul, Minneapolis & Manitoba consolidated mortgage 4 per cent. bonds of 1883-1933. These are part of a total authorized issue of $50,000,000, of which $13,344,000 are 6 per cent. bonds, $21,220,000 4½ per cent. bonds, and $8,718,000, which includes the present issue, are 4 per cent. bonds. The present issue has been made to retire an equal amount of prior lien bonds, including $2,881,000 Dakota extension 6 per cent. bonds maturing November 1, 1910. The 4 per cent. bonds will therefore be secured after November 1, 1910, by a first lien on 2,549 miles of road at the rate of about $17,000 per mile. The issue closes the mortgage.

INTERNATIONAL & GREAT NORTHERN.—It is reported in Austin that the receivership sale of the road, which is set for Sept. 15, will be postponed until April next. The object of the proposed postponement is that some arrangement may be made for paying the unsecured claims outstanding. These claims aggregate about $1,000,000. (See Texas Legislation under another head.)

IOWA CENTRAL.—Brown Brothers & Co., New York, are offering $154,000 car trust 5 per cent. certificates of the Iowa Central at prices to yield about 5.20 per cent.

LONG ISLAND.—This road has been authorized by the New York State Public Service Commission, Second District, to issue its 4 per cent. ten-year gold debenture bonds to the Pennsylvania Railroad Company to the amount of $2,000,000, in payment of moneys advanced by the latter company which the Long Island used for the acquisition of property and the construction of additions and betterments. Main line improvements between Winfield and Dunton, which the applicant asked authority to also reimburse the Pennsylvania Company for, are left for future decision by the commission.

MANISTIQUE RAILWAY.—The Union Trust Co., Detroit, as trustee of the second mortgage bonds due July 1, 1919, is to sell the property of the Manistique Railway, under the provisions of the general railway law, at auction on September 28 at Munising, Mich. The road runs from Grand Marais, Mich., to Wilman, 53 miles, with 20 miles of branches and 13 miles of sidings and spur tracks. There are $75,000 second mortgage 6 per cent. bonds, dated July 1, 1909, now outstanding. The amount said to be due is $76,125. The foreclosure is subject to the first mortgage of 1897-1902, under which $35,000 bonds are now outstanding.

QUEBEC & LAKE ST. JOHN.—Holders of the prior lien first mortgage and income bonds, at a meeting held in London, August 8, approved the conversion of the bonds as suggested in the circular of July 29. (Aug. 12, p. 295.)

It is said that Liang Shih-yi, director of the Chief Railway Department in Peking, has been in charge of the following 10 railways: Peking-Hankow, Peking-Mukden, Chengtung Taiyuan, Tao-Ching, Pienliang-Loyang, Pinghsiang-Hsiangtan, Peking-Kalgan, Shanghai-Nanking, Kowloon-Canton and the West Mansolea. According to his statement only two of these lines, the Peking-Hankow and the Peking-Mukden, realized profits last year. The result of investigation shows the following losses for different lines: Shanghai-Nanking, $605,000; Chengting-Taiyuan, $363,000; Tao-Ching, $60,500; Pienliang-Loyang, $363,000; Peking-Kalgan, $90,750; West Mansolea, $9,075. These are approximate figures. The Pinghsiang line realizes a profit, and the receipts for the Peking-Mukden line last year were about $6,655,000, and the Peking-Hankow about $5,808,000. For these two lines, after deducting the expenses and interest, there is a net profit of $5,445,000, which, after making up the above deficiencies, leaves about $3,932,500. This amount in the near future will be devoted to the construction of additional railways, for which there is a demand.

Supply Trade Section.

The Hanna Locomotive Stoker Co., Cincinnati, Ohio, has been incorporated with a capital of $500,000. The incorporators are W. T. Hanna, Clara Stanns, Theodore W. Meader, John Middlehof and John M. Ballage.

M. A. Beck, for a number of years chief engineer of the Pawling & Harnischfeger Co., Milwaukee, Wis., has been made consulting engineer and representative in the Milwaukee district of the Toledo-Massillon Bridge Co., Toledo, Ohio.

The plant of the Youngstown Car Manufacturing Co., Youngstown, Ohio, with the 13 acres of land surrounding it, has been sold to Wilkoff Bros., large scrap iron dealers. A foundry and a plant for making a patent concrete steel bar will be started by Wilkoff Bros. and the manufacture of cars will be discontinued.

The Highland Iron & Steel Co., Terre Haute, Ind., has bought the works of the Blue Island Rolling Mill & Car Co., Blue Island, Ill., for $90,000. The deed was filed in the recorder's office at Chicago, August 25, and is signed by F. H. Niles, president, and F. S. Foragher, secretary of the Blue Island Rolling Mill & Car Co.

W. H. Marshall, president of the American Locomotive Co., New York, has been elected a director and member of the executive committee of the Railway Steel-Spring Co., New York, succeeding S. L. Scoonmaker, resigned. F. F. Fitzpatrick, vice-president of the latter company, has been appointed also to the executive committee.

The Marion Shovel & Dredge Co., Marion, Ohio, has been incorporated, as mentioned in the *Railway Age Gazette* of Aug. 26. The officers are John D. Owens, president; Clifford Owens, David Evans and George B. Christian, Jr., vice-president; A. E. Cheney, secretary and general manager; George D. Copeland, treasurer, and Harry Barnhart, chief engineer.

The Improved Block Railway Signal System of Hammond, Ind., has been incorporated with a capital stock of $50,000. The object of the corporation is to promote the "Improved Block Railway Signal System" and establish a shop. The principal place of business is Hammond, Ind. Charles D. Anderson, Howard Rose and C. S. Beneppe, directors.

E. S. Hand, formerly installation engineer of the Mississippi Wire Glass Co., has acquired an interest in the Pennsylvania Wire Glass Co., successors to the Continuous Glass Press Co., with works at Dunbar, Pa. The company's executive offices are in Philadelphia, with a branch office at 100 Broadway, New York, where Mr. Hand makes his headquarters.

The directors of the Lackawanna Steel Co., New York, at a regular meeting last week authorized the expenditure of about $800,000 for the immediate construction of an additional merchant mill at Buffalo, N. Y. This is in keeping with the board's policy of further diversification of the company s products, and will enable it to distribute more of its steel among consumers in its natural territory. It is expected that the new mill will be ready for operation about July 1, 1911.

The Isthmian Canal Commission will receive bids until September 9 for an oxy-acetylene welding and cutting plant, cold-rolled steel, bronze, driftbolts, copper gaskets, lock washers, screws, valves, cocks, steam whistles, water gages, water-gage glasses, hose nozzles, pipe fittings, slip scrapers, chain blocks, grindstones, saws, vises, peavies, cold chisels, reamers, foundry brushes, horse brushes, headlight burners, lantern globes, door catches, buckles, cups, steel tapes, rules, twine, rubber valves, engine oil, coke, etc. (Cir. 601), and until September 19 for lumber, dredging sleeves, hose, suction pipe, brake shoes, road machines, lanterns, etc. (Cir. 602).

TRADE PUBLICATIONS.

Interlocking and Signaling Devices.—The Union Switch & Signal Co., Swissvale, Pa., has just issued a catalogue and price list covering its interlocking and signaling devices.

Denver & Rio Grande.—A new coast-to-coast map has been issued, drawing particular attention to the new Western Pacific, the extension of the Denver & Rio Grande, from Salt Lake City to San Francisco.

RAILWAY STRUCTURES.

CHICKASHA, OKLA.—The Chicago, Rock Island & Pacific is receiving bids for a passenger station 32 ft. x 200 ft., to cost $35,000.

CINCINNATI, OHIO.—An ordinance authorizing the Union Depot and Terminal Company of Ohio to build a union depot has been signed by Vice-Mayor Galvin. An ordinance which was passed June 29 was vetoed.

DALLAS, TEX.—The Houston & Texas Central will ask bids at once, it is said, for putting up a new freight house in Dallas to cost about $40,000.

DOVER, DEL.—An officer of the Pennsylvania Railroad writes that it is the intention of the company to build a new passenger station in Dover, also a passenger tunnel. The detailed plans have not yet been finished, and bids are not yet asked for the work. It is proposed to put up a brick station 35 ft. x 100 ft.

DULUTH, MINN.—See Duluth, Winnipeg & Pacific under Railway Construction.

FREDERICK, MD.—See Frederick Railroad under Railway Construction.

FORT WILLIAM, ONT.—A contract has been given to Carter, Halls, Aldinger Co., general contractors of Fort William, it is said, for the construction of the new Canadian Pacific car shop. Ground has been broken, and test pits were dug for the foundation of the shops, which will be located in the yards near the overhead bridge. The structure is to be 50 x 170 ft. (April 22, p. 1069.)

FULTON, ILL.—The Chicago & North Western will build a roundhouse and machine shops to cost $75,000.

GILLUM, ILL.—The Big Four has given a contract to A. Yauger, Pekin, Ill., to build a four arch concrete bridge at a cost of $30,000.

HARTFORD CITY, IND.—The Pittsburgh, Cincinnati, Chicago & St. Louis is having plans made for a brick passenger station to cost $15,000.

INDIANAPOLIS, IND.—Plans for new freight terminals for all of the divisions of the Pennsylvania lines entering Indianapolis have been approved. Immense freight houses and extensive tracks will be built on South street. The expenditure, including the real estate, will approximate $4,000,000.

JOLIET, ILL.—Plans are being made for a union station to cost $75,000.

MATTOON, ILL.—The Big Four will build a roundhouse containing 30 stalls. It will be equipped with the direct vacuum return steam heating system, boiler wash-out system, drop pits, new ash pits and coaling station. (Aug. 5, 1910.)

NEW YORK, N. Y.—See an item in general news in regard to the New York Central & Hudson River.

OMAHA, NEB.—The Chicago, Burlington & Quincy has given a contract to T. S. Leake & Company, Chicago, to build the new freight house. (June 10, p. 1440.)

OGDEN, UTAH.—The Ogden Union Railway & Depot Co. has approved plans for an annex to the present union depot. The building will cost about $100,000, and will be used for baggage and express purposes.

READING, PA.—The Philadelphia & Reading will build a new steel bridge, it is said, over the Schuylkill river at Mill Creek Junction, near Port Carbon.

ROANOKE, VA.—The Virginian Railway is building a five-stall roundhouse with shop annex at a cost of $30,000.

ST. LOUIS, MO.—The Missouri, Kansas & Texas has given a contract to the Murphy Construction Co., East St. Louis, Ill., to build a brick roundhouse at Gimblin road. It will contain 15 stalls and cost $40,000.

VICTORIA, VA.—The Virginian Railway is building a five-stall roundhouse with shop annex at a cost of $30,000.

Late News.

The items in this column were received after the classified departments were closed.

Not only the New York, New Haven & Hartford but also the Boston & Maine and other New England roads will, on October 1, adopt revised car demurrage rules, reducing the free time from 96 to 48 hours.

The Texas Legislature on August 31 finally enacted the bill validating the claims of creditors against the International & Great Northern. The bill was passed in the House as it came from the Senate, and will become effective upon receiving the Governor's approval. It validates approximately $2,000,000 of unsecured claims against the International & Great Northern Railroad which will have to be assumed by the purchasers of the road this month. As passed, no claims will be allowed which were incurred prior to two years before the road went into the hands of a receiver.

At the hearing before the special examiners for the Interstate Commerce Commission at Chicago on Wednesday it was said that probably the railways would seek to compel the shippers, who oppose the advance in freight rates, to declare how much they profit on the different commodities under consideration and the return they enjoy on their invested capital. One prominent railway man declared that the roads might well ask the shippers what their profits are on the commodities affected by the proposed increase in freight rates so that the commission may know whether they are or are not seriously disturbed by the increase which they are fighting. F. O. Melcher, second vice-president of the Rock Island, testified concerning increased expenses due to advances in the wage scale and increased cost of operation. He said that the road does not get more efficient labor by reason of the increased wages. No change is likely to restore any part of the wage increase unless the road can get more for hauling freight. "In the fiscal year just closed," said Mr. Melcher, "the gross earnings increased $5,300,000 and the operating expenses increased $5,500,000." Legislative measures had increased the cost of operating. "I do not object to the safety appliance law," said Mr. Melcher; "it was a good thing, but it does not save money. We have to have as many men on a train now as before the automatic brake was installed. The hours of labor bill was a proper bill, but has required more men and an increased expenditure. Other required regulations have been good, but they all cost money. Altogether, I should say that the increased volume of traffic has not kept pace with the increased cost of operation."

The New York State Public Service Commission, Second district, has assumed jurisdiction over the operations of telephone and telegraph companies. All telephone companies, corporations, associations, partnerships or persons owning or operating any telephone line in the state for profit whose property is in excess of the value of $10,000 will come under the jurisdiction of the commission. All telegraph companies, however, are within the jurisdiction of the commission. The new law is very similar to that which has been in force during the last three years concerning other public service corporations. Telephone and telegraph companies are required to afford adequate service at just and reasonable rates, and discrimination in favor of any particular person or corporation and in giving any unreasonable preference of any kind is prohibited. No free or reduced service or free pass or frank can be given except to the employees of the corporation and their families and persons engaged in certain lines of charitable work. The corporations are required to file with the commission schedules showing rates, rentals and charges for services, also all contracts and agreements in writing between companies affording telephone and telegraph service relating in any way to construction, rentals or use of lines of telephone or telegraph companies. The companies are required to file each year an annual report which is a public record and may be examined at the office of the commission upon request. Out of about 1,200 telephone companies in New York 115 will come under the jurisdiction of the commission, all of whom have property in excess of $10,000. The commission has opened a New York office in the Metropolitan tower.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Carnegie Steel Company has ordered one six-wheel switching locomotive from the American Locomotive Company.

The Pittsburgh, Shawmut & Northern has ordered from the Baldwin Locomotive Works two consolidation locomotives in addition to the two mentioned in the *Railway Age Gazette* of August 5. The four engines are for December delivery.

CAR BUILDING.

The San Antonio & Aransas Pass is in the market for four passenger cars.

The Mexico Northeastern is said to be in the market for 200 logging cars. This item is not confirmed.

The Dold Refrigerator Car Line, Wichita, Kan., is in the market for 50 steel underframe refrigerator cars.

The El Paso & South Western is said to be in the market for four postal, three baggage, two mail and two chair cars. This item is not confirmed.

The Chicago, Milwaukee & Puget Sound is reported to have authorized the building of 250 logging cars in its company shops. This item is not confirmed.

The Michigan United Railways, Jackson, Mich., reported in the *Railway Age Gazette* of July 15 as being in the market for 30 city cars, have placed this order with the J. G. Brill Co., Philadelphia, Pa. The trucks were ordered from McGuire-Cummings Co., Chicago.

The National Railways of Mexico, as reported in the *Railway Age Gazette* of July 15, have ordered 1,600 box, 500 gondola, 100 tank, 150 flat and 150 stock cars from the American Car & Foundry Co. The flat and stock cars are for delivery during September, the box cars beginning in September, the gondola cars during October and November, and the tank cars during October. The flat cars, 40-ton, will be 36 ft. 9 in. long, 9 ft. 3 in. wide, 3 ft. 9⅞ in. high, over-all measurements. The stock cars, 40-ton, will be 36 ft. long, 8 ft. 5⅝ in. wide, and 7 ft. 6¾ in. high, inside measurements, and 8 ft. 7⅝ in. wide and 12 ft. 9½ in. high, over all. The box cars, 40-ton, will be 36 ft. long, 8 ft. 6 in. wide, 7 ft. 6¾ in. high, inside measurements, and 37 ft. 10½ in. long, 8 ft. 7⅝ in. wide and 12 ft. 9½ in. high, over all. The gondola cars will be of 50-ton capacity and the tank cars will be of 12,500-gal. capacity. The following special equipment will be used to all cars where required, except as noted:

Bolsters, truck	American Steel Foundries; Keystone
Brakes	Westinghouse
Brake-beams	Buffalo Brake-Beam Co.
Couplers	Simplex
Draft gear	Miner
Dust guards	Security
Journal boxes	Symington
Roofs	Corrugated iron
Springs	Railway Steel-Spring Co.
Trucks	Andrews type
Wheels	33-in. cast iron

The following refers to the tank cars only:

Bolsters, truck	Metal
Draft gear	Union Draft Gear Co.
Dust guards	Harrison
Trucks	Arch bar
Wheels	33-in. double plate

IRON AND STEEL.

The Pennsylvania Lines West are in the market for an additional 700 tons of structural steel.

The Elgin, Joliet & Eastern has ordered 200 tons of structural steel from the American Bridge Company.

The Boston & Maine has ordered 175 tons of structural steel from the New England Structural Steel Company.

General Conditions in Steel.—Activity in the steel market seems to be due to small quantity orders only, as far as new business is concerned. A heavy volume of specifications against existing contracts is reported, but as this has been the condition for some time, mill operations will show a shrinkage unless a buying movement sets in soon. Railway buying continues

to be for immediate requirements only. By the first of the year the Bethlehem Steel Corporation, it is said, will be producing pig iron at a rate of 900,000 tons per year. This increase is due to the construction of new mills within the last few years. At its Bethlehem works this company is employing about 12,000 men, which is the largest number ever employed at the plant.

SIGNALING.

The New Orleans & Northeastern is to begin soon the erection of automatic block signals over a large portion of its main line.

The Indiana State Railroad Commission has sent out a letter to the roads of that state requesting them to advise what progress they are making toward the introduction of block signals. As the time limit approaches the commission is anxious to see some effort being made to carry out its order.

The Pennsylvania has appointed signal apprentices from Lehigh University, Sheffield Scientific School and Pennsylvania State College. The Pennsylvania now has in service 20,725 signal functions, worked by 8,792 levers. The number of functions is almost three times what it was in 1902.

Mr. Patenall, signal engineer of the Baltimore & Ohio, reports that one of the lamps in his signals, which are automatically lighted on the approach of trains, has been in operation regularly for over four years. This lamp was put in service August 1, 1906, and the filament burned out on August 5, 1910. It was lighted and extinguished, automatically, 73,200 times. The lamp was a 2-c.p. 11-volt, and was purchased at an electric supply store. It was on signal No. 94, at Elkridge, Md. In comparison with oil or other methods of lighting signal lamps, he thinks that the performance of this lamp is well worth recording. It never failed to light up properly. The automatic lighting of lamps on automatic signals in this territory operates in conjunction with the normal danger system of signaling, as set forth in the Patenall and Dryden patent, but the lighting system can be applied with the normal clear system of signaling.

A Gas Heated Boiler.

In the heating plant of the Bettendorf Axle Company, Bettendorf, Iowa, a vertical water tube boiler is used. There are two annealing furnaces in these buildings, and the waste gases are utilized to assist in heating the boiler. The boiler was set between the furnaces with a gas duct leading to it from each furnace, with a damper and separate stack to deflect the heat from the boiler when it is not desired to pass through it. An auxiliary oil burner is also installed for use when additional heat is required.

In the illustration this boiler is shown with the hot well, in which a feed pump is installed to return the water of condensation to the boiler. The main carries a 70-lb. pressure, maintained by a pressure regulator near the boiler, and each branch line carries a pressure of two pounds, maintained by separate regulators. The sizes of the leads and the low pressure mains are so proportioned that a slight pressure is carried in the top pipes of the radiating coils with atmospheric pressure or partial vacuum in the lower pipes. This gives a supply of steam at sufficient pressure at two extreme points on the low pressure mains to permit the use of gravity heating systems and cast iron radiators for an outside general office building and a testing laboratory. The heating plant was designed and installed by the Horace L. Winslow Company, Old Colony building, Chicago, to whom we are indebted for the illustration and description of this economical method of heating.

Heating Boiler.

Piping in Shop.

Winslow Heating System; Bettendorf Shops.

D. & L. Throttle Rod Stuffing Box and Plastic Packing.

The accompanying illustrations show a new design of throttle rod stuffing box, with which a plastic packing is used.

It is claimed that this plastic packing, as used in this stuffing box, is leak proof, and that the box can be repacked when the boiler is carrying a full head of steam. When applied for the first time, however, the engine should be dead. Reference to the illustrations shows that a brass nut is screwed down after the storage chamber is put in place. This chamber is held in position by the shoulder, and is made a snug turning fit with the nut. A port in the bottom of the chamber may be made to coincide with the port in the main casting, or, by giving the chamber a half turn, the port is closed. When packing for the first time, the port is turned to the open position and the packing forced in by aid of the plunger. About four tubes are required to fill the stuffing box.

In repacking, it is necessary first to close the port in the storage chamber so as to prevent any escape of steam. The chamber is then filled, the plunger replaced, after which the port is opened and the packing forced in by screwing down on the plunger. It is suggested that about a teaspoonful of valve oil should be added with each stick of new packing and that the packing should be oiled about once a month to assure an easy working rod.

The stuffing box conforms in design to those generally used,

so that replacement is easily accomplished. For new or old power with throttle rigging of odd design, the D. & L. stuffing box can be especially made.

Following are claims made for this stuffing box and packing:

Adaptability to old as well as new power without any change in throttle rod or connections.

Saving of time required to pack throttle, both in labor and by retaining the engine in service. The engineer can carry packing in the seat box and pack throttle when necessary.

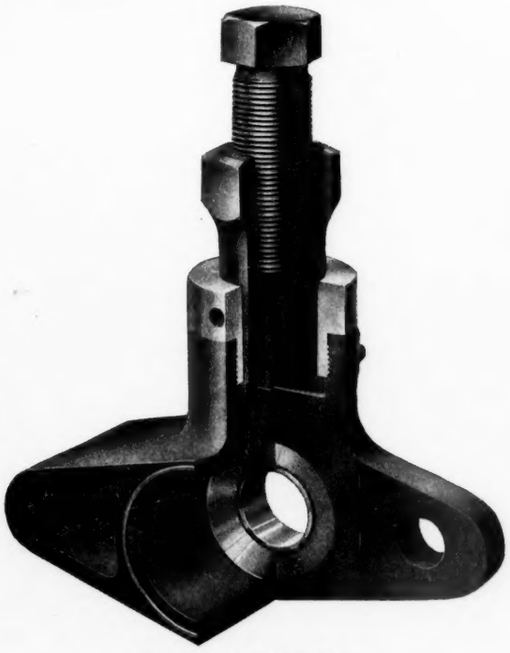
Throttle handles operate 50 per cent. easier than with other throttle packings

Long life of packing due to thorough lubrication.

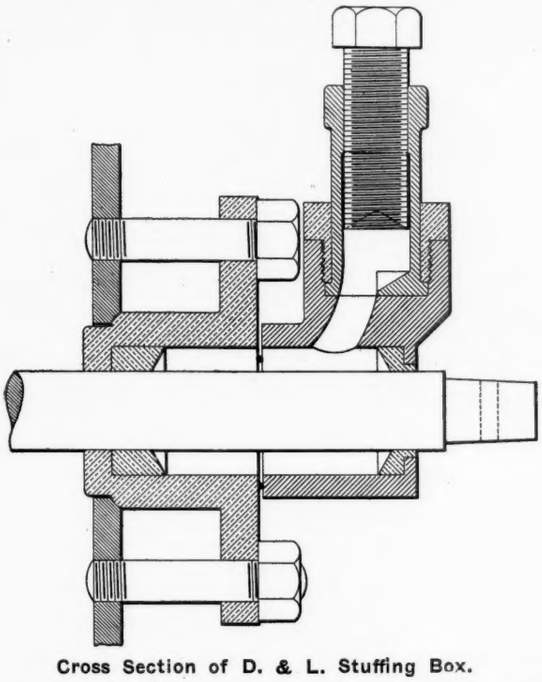
Minimum wear upon throttle rod.

The complete avoidance of delays to motive power caused by an occasional oversight of the condition of the throttle packing.

One size packing for all size throttle rods.



D. & L. Stuffing Box.
Quarter removed to show interior arrangement.



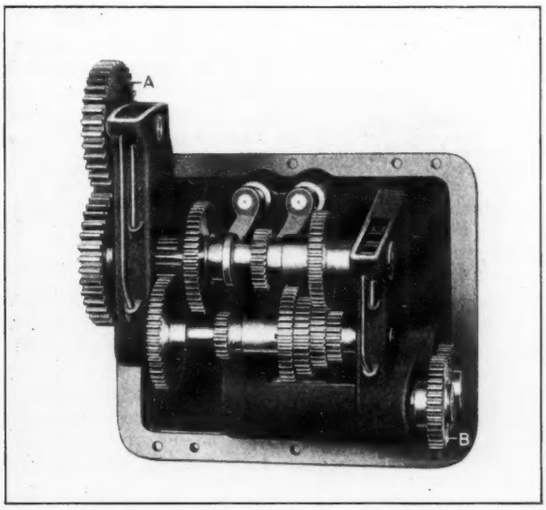
Cross Section of D. & L. Stuffing Box.

This stuffing box and packing is sold by the Union Machine Co., St. Paul, Minn.

Shop Equipment.

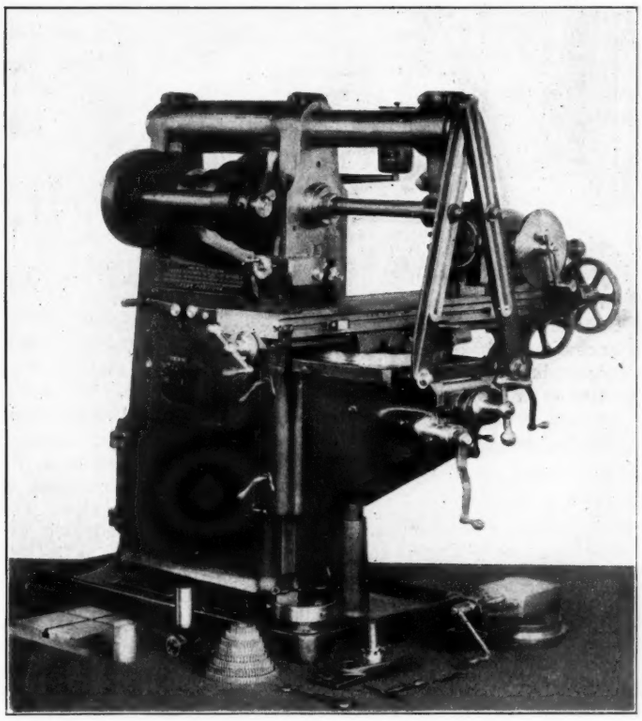
New Cincinnati Cone-Driven Miller.

A portion of the milling work in every shop is light and can therefore be handled on a modern cone-driven miller as fast and as accurately as on the more highly developed single-pulley type machine. The Cincinnati Milling Machine Co., Cincinnati, Ohio, has redesigned its entire line of cone-driven millers for this class of work, and the illustrations herewith show the more important improvements that have been made.



Driving Gears of Cincinnati Miller.

The column is very similar to that used on this company's high power machines. It is a symmetrical box section, having straight lines, and is sufficiently large to contain the entire feed-drive mechanism. The feed changes are all obtained from a single group of mechanism which is mounted in the column at a point high above the floor, bringing all the levers within easy reach, and the index in plain sight, of the operator. The



New Cincinnati Cone-Driven Miller.

feed mechanism provides 16 feed changes from .007 to .3 per revolution of the cutter. All of these changes are obtained through 12 gears located between the housings.

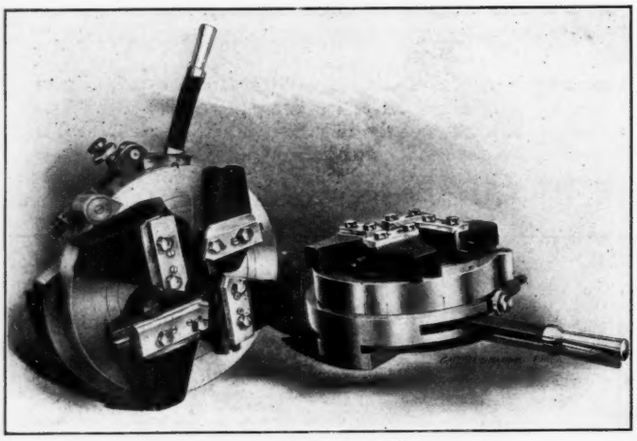
The design provides simplicity, with handiness in operation. The machine is driven directly from a face gear which meshes with the gear A. Power is transmitted through the change gears to the gear B which drives the universal joint shaft. All of these 16 feed changes are obtained by the three levers shown on the box. The feed index, mounted above the levers, indicates the exact lever position for each rate of feed.

The most striking feature of this design is the tumbler construction. This tumbler is made in the form of a cylinder, of large diameter, which supports the tumbler shaft and gear and is itself supported in the frame of the feed box. This construction prevents bending the tumbler shaft and vibration in the tumbler. The operating lever projects through a hole in the feed box in the usual way, but as this opening is closed by the tumbler, the inside mechanism is protected from the dust.

Stationary Die Head for Pipe Threading.

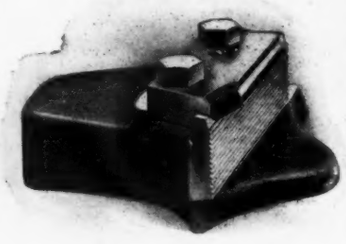
The illustrations herewith are of a stationary die head and parts for pipe threading, as manufactured by the Landis Machine Co., Waynesboro, Pa., using the Landis type of die with a manually operated die head.

The die head is made especially for use on pipe-threading machines in which the pipe revolves while the head remains stationary. The head and the die holder are made of steel. The head can be mounted on a carriage of any standard pipe



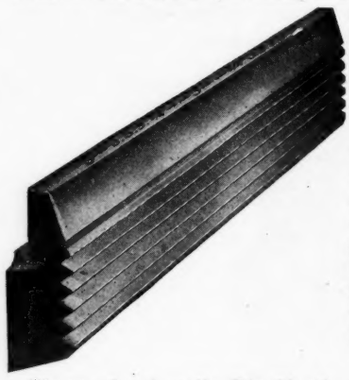
Landis Stationary Die Head.

machine and handled in the same manner as the other styles of head. The chasers for these die heads can be made to good advantage of high-speed steel, in which case they require no annealing, rehobbing or retempering. Sharpening of the die is accomplished by grinding the ends of the chasers and resetting them to the correct cutting position in the holder. The heads are made in standard sizes to take work up to and including four inches. One of the great advantages of this die head is that one set of dies will cut all diameter pipes of the same pitch. The heads are graduated for setting the dies to the different diameters, and are opened and closed by hand, using the lever shown. When in the closed position the die is rigidly locked, but opens and closes freely.



Chaser in Holder.

The chaser holder illustrated is for use where not necessary to cut very close to the shoulder. The mill clamp which holds this chaser also protects it in case the pipe should split. The clamp extends down over the throat of the die and is rounded out near the cutting point so as to act as a guide for rough ends. When a twist occurs in the pipe, most of the strain is thrown on the clamp, thus protecting the die and lessening the possibility of breakage. In case of threading close to the shoulder, a clamp made flush with the front edge of the chaser only is used, thus permitting the die to run close up against the shoulder, as in threading short nipples, etc.



Chaser for Landis Die Head.

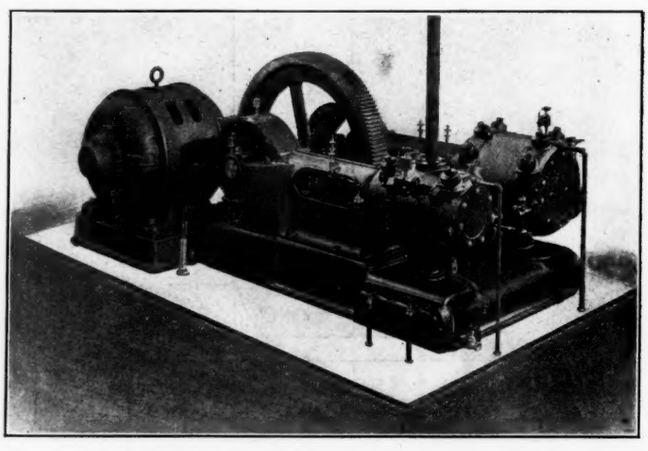
It is claimed that this die admits of cutting speeds from 25 to 100 per cent. higher than the hobbed type of die. The rake can be ground to suit the quality of the material in the pipe, as a great deal of the merchant pipe used is very stringy and tough.

Advantages in this head are in the life of the dies, the higher cutting speeds, and the flexibility of the die to meet the different qualities of material. All dies are made interchangeable, and if one chaser of a set becomes worn before the others, this single one can be replaced.

Motor Driven Air Compressor.

A good example of the simplicity, convenience and efficiency of electric motor drive is the application shown in the illustration, 50-h.p., a.c., Westinghouse, type MS mill motor, direct-connected to a two-stage air compressor, manufactured by the Chicago Pneumatic Tool Company, Chicago. The compressor has a 14-in. low pressure, and a 9-in. high pressure air cylinder; an 11-in. stroke and a mechanical valve. This valve, which is connected with the high-pressure cylinder by a ¼-in. pipe, stops the compression when the air has reached a pressure of 85 lbs.

The air is used in operating the interlocking switches in the



Motor Driven Air Compressor.

yards of the Union Railroad, near Bessemer, Pa.; the riveters, drills, etc., used on the repair tracks, and for testing the air-brakes on the cars. The compressor runs 24 hours every day; during this time the switches are in operation continuously, and the repair men work 10 hours a day. During the summer, box cars are painted with a pneumatic sprayer.

The Westinghouse motor runs at 725 r.p.m. on a three-phase, 25-cycle, 440-volt alternating current. The compressor runs at 175 r.p.m.

A. F. Coulter, general car foreman of the Union Railroad, is quoted as authority that this equipment has been in continuous operation for six months with no attention except that for occasional cleaning and oiling.

The receipts from 1,605 miles of Chilian government railways in operation in 1909 amounted to $9,080,992, comparing with $8,625,211 in 1908. The operating expenses on these lines were greater than the gross earnings.